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ABRIDGMENTS

OF THE

Specifications

RELATING TO

MARINE PROPULSION.

(EXCLUDING SAILS.)

IN THREE PARTS.

WITH INDEXES OF NAMES AND SUBJECT-MATTER.

PRINTED BY ORDER OF THE COMMISSIONERS OF PATENTS.

37

LONDON:
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PREFACE.

In Part I. of this work there is a summary of the principal British and early foreign inventions relating to the propulsion of vessels. These are arranged chronologically, with Abridgments of the Specifications of British Patents, to the end of A.D. 1830. The claims of Papin and of various American inventors are further considered in the Appendix, where important information will be found, gathered from documents, some of which have been hitherto unpublished, or only recently available.

In Part II. will be found Abridgments of the Specifications of all the British Patents on the subject, from A.D. 1831 to the end of A.D. 1847, together with a few notices of unpatented inventions and of experiments. A few omissions in Parts I. and II. are supplied in the Addenda.

In Part III. are given the Abridgments to the end of June, A.D. 1857; the Index of Names, and Index of Subject Matter refer to all three Parts of the work.

To facilitate the compilation of these Parts into one volume, the pages are numbered consecutively throughout.

It is not the object of this work to compare the merits or originality of the inventions recorded; but in one or two instances of special importance and of national interest the evidence for and against particular claims has been briefly considered. It must also be borne in mind that these publications are not prepared with a view to their being used to explain doubtful descriptions of an invention; the complete Specification being still the only true guide to the inventor's claims. Some interesting statistics respecting the Patents relating to Marine Propulsion, and the development of the inventions in modern times, have been given in Appendix C.

By consulting the Index of Subject Matter it will be observed that several important inventions have been brought forward over and over again as entirely new, at various intervals of time, and it is evident that this might have been prevented had there been brief and clear records published of everything proposed before.

It is hoped, therefore, that the publication of these Abridgments will prevent the misapplication of time and labour in the operation of re-inventing what is already known, and, by recording the experience of the past, will direct the energy of the ingenious to improve upon old plans, and to exercise themselves in new fields of labour.

B. WOODCROFT.

June 1858.

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MARINE PROPULSION.

An animal swims when it is propelled by its limbs acting directly on the water supporting it (*a*).

The ancient people of Assyria, Egypt, Babylonia, and China floated on bundles of reeds or inflated skins, propelled by their legs moving in the water (*b*). These methods are still used on the Nile and the Euphrates, and in the West Indies (*c*).

(*a*) See Isaiah, ch. xxv. ver. 11. (1.) The bodies of animals are propelled by legs, arms, fins, tails, paddles, membranes or cilia, acting like oars in the water. The tail of a fish propels by oblique pressure on the water (like the blade of an oar in sculling). The tail of a lobster propels it backwards by a smart direct stroke against the water below. (2.) The Cuttle-fish is propelled forwards by fins, and backwards by ejecting water from a tube. The Paper Nautilus (Argonaut) is also propelled by ejecting water (and not otherwise by its limbs, acting as oars or sails, as is often alleged). (3.) The marine animals Velella (with a flat raft or disklike body) and Physalia ("Portuguese Man-of-War," with a body like a small sac or bladder,) float on the water, and are propelled by the wind acting on their extended membranes. Aquatic birds (such as the swan) extend their feathers so as to sail with the wind. (4.) Whelks creep on a muscular disk. (5.) Pedipes and Truncatella "loop" like the "geometric" caterpillars. (6.) Others creep by drawing and pushing. (7.) The Mud-fish (Lepidosiren) swims and creeps at once. See note (*a*), p. 16, (*post*); also Owen's Lectures on Comparative Anatomy of Invertebrate Animals, London, 1855, 2nd edition, p. 605; Carpenter's Physiology, London, 1854, p. 645.

(*b*) See the bas-reliefs from Nineveh, Nimroud side Gallery, British Museum, 8 b. (men floating on skins), also Kouyounjik Gallery, No. 55 (a man astride on a skin); Layard's Monuments of Nineveh, London, 1849, pl. 16; Layard's Monuments of Nineveh (*second series*), London, 1853, pl. 28 (a man swimming on a skin, and towing a reed boat). Isaiah, ch. xviii. ver. 1, 2. Skins were similarly used in China; Mémoires concernant l'Histoire, &c. des Chinois, par les Missionnaires de Pe King, 15 vols., Paris, 1782, vol. 8, pl. 13, fig. 56. Reeds, see woodcut in Chinese book on Education, press 5, University College Library. An Arab floating dress, of two bulls' hides is represented by Robertus Valturius, De Re Militari, Veronæ, 1472 (the copy in the British Museum library has neither chapters nor pages numbered); also a man in armour, crossing a river, standing erect on skins, a plan, he says, used by Julius Cæsar (quoting Suetonius). Leather skiffs, hose filled with air, life belts, and a circular float supporting a man with paddles on his legs for swimming, are represented in Lupoldi Theatrum Machinarum Generale, Leipsic, 9 vols. in 5, 1724–39, vol. 7, 8, tab. 3. See Notice of Borelli's Invention, p. 16, (*post*).

(*c*) Chesney's Expedition to the Euphrates, (2 vols., London, 1850,) vol. 2, p. 633, 640; Layard's Nineveh, vol. 2, pp. 96, 382; Vincent's Navigation of the Ancients, 2 vols., London, 1807, vol. 2, p. 535; Humane Industry, London, 1661 p. 150; Supplement to Harris' Dictionary of Arts and Sciences, London, 1744, Art. "Ship." Men cross rivers on a yoke of large gourds.—Barth's Travels in Africa, 5 vols., London, 1857, vol. 3, pp. 36, 469.; or on reeds (Dr. Livingstone). The Tartars tied a float of reeds to the tail of a horse swimming a river with his rider.—Churchill's Voyages, vol. 2, p. 463 (drawing).

The Chinese used a round boat propelled by the palm of the hand (*a*).

The Egyptians (*b*), Assyrians (*c*), and Babylonians (*d*) used wicker boats, made water-tight by bitumen outside and inside (*e*), and propelled by one man with a short oar or paddle, or by two men standing and facing each other (*f*), as is now done in the Mediterranean.

(*a*) Mémoires, &c. des Chinois, vol. 8, p. 358, pl. 13, fig. 56.

(*b*) Exodus, ch. ii. ver. 3.; Pliny, lib. 13, Nat. Hist.; Lucan, lib. 4., Phars.

(*c*) See the bas-reliefs from Nineveh, referred to in note (*b*), p. 1, *ante*, and note (*f*) *post*.

(*d*) Sir H. Rawlinson (A.D. 1857) considers that the boats on the Euphrates were coated with bitumen only, as at present. They are described as covered with skins in Herodotus, 1, 194. "In some cases, though but rarely at the present day, the basket-work is covered with leather," Chesney's Expedition, vol. 2, p. 640; Layard's Nineveh, vol. 2, p. 381.

(*e*) Genesis, ch. vi. ver. 14; Exodus, ch. ii. ver. 3. Quicklime paste, used for caulking by the Chinese (Sir G. Staunton), Charnock's History of Marine Architecture, 3 vols., London, 1800, vol. i. p. 3.; Marsden's Marco Polo in A.D. 1271, London, 1838, p. 567 (*n*). Flax caulking, Pliny, lib. 19, cap. 1. Human fat used for caulking, A.D. 1520, in Mexico, Purchas's Pilgrims, London, 5 vols. fol. 1625, vol. 3, p. 1122. Acta Eruditorum, Leipsic, 1686, p. 413.

(*f*) See Blakesley's Herodotus (2 vols., London, 1854), vol. 1, p. 145, note 660. Nimroud Side Gallery, British Museum, 8 b, where the oars are like crosses. Other methods of propulsion by paddles used by hand may be referred to, such as a raft moved by two men, Kouyounjik Gallery, British Museum, 54. A boat, with two rowers at each end, all facing inwards, with oars formed of cane bent at the end, tied in a semi-circle, and with a cross piece (ibid). Armed galley with 17 broad oars on each side, in two banks (ibid 2). Boat rowed by two men, without rowlocks, and one steering. Nimroud Side Gallery, 9 b. (The Nineveh rowlocks seem to be triangular.) Bitumen canoes on the Euphrates, propelled by two men facing the bow, Chesney's Expedition, vol. 2, p. 642. The Kufah, by two men standing side by side, ibid., vol. 1, p. 57, pl. 3. "A very narrow framework of bulrushes covered with bitumen," and propelled by two men, with long light bamboo poles, on the Afaij marshes, Layard's Nineveh and Babylon, London, 1853, p. 552. Kouyounjik Gallery, 4 and 5. Various paintings and sculptures in Egypt depict the use of oars by the ancient Egyptians. Of the copies of these in Lepsius' great work, Denkmaeler aus Aegyptien und Ethiopien, Berlin (in progress), see especially band 3, abt. 2, bl. 101, gr. 22 (b), a man sitting with what appears to be a double paddle; band 3, bl. 43, rowers facing the stern; bl. 12, rowers facing the side and holding one oar in each hand, both oars being on the same side of the boat, and each oar held by two men, who swing sideways standing; band 7, bl. 232 (a), two men with short paddles and facing the bow; band 5, bl. 17, rowers facing the stern and rowing with rowlocks like short curved pins (not usually represented); bl. 45 (b), oars with slings along the loom; band 4, bl. 103 (b), rower sitting to row with one leg raised; rower sitting on a framework fore and aft in the boat. The use of the oar in Egypt for steering is noticed in note (*a*), p. 8, *post*. An old Japanese dictionary, in thirteen volumes, in the British Museum, contains a woodcut on rice paper of a man rowing, with a rope (four feet long) tied to the oar between his hands, and to the bench before him as he faces the stern. (The book is without date, but is marked "Examined by Chetqua, Dec. 17, 1770; the book is in the old character.") Charon's boat, sewed together, was propelled by one oar at the stern, Virgil Aen., lib. 6, 413. Canoe on lake Wolda, in Muscovy, by a single oar at the stern, Charnock's History of Marine Architecture (3 vols.), vol. 1, p. 3. Hollow tree canoe, on the Euphrates at Kurnah, by one man at the stern, Chesney's Expedition, vol. 2, p. 642. The Canadian canoes are now propelled thus.

Lucan states that a small boat (called Carabus), of wicker-work covered with hide, and moved by short oars, was used on the Po (*a*).

Skin canoe of the Mandan Indians (a tribe now extinct, but founded before A.D. 400, by ships drifted from Wales, Appendix A. to Catlin), propelled by a woman, reaching a broad oar forward and drawing it in, Catlin's North American Indians, (2 vols., London, 1841,) vol. 1, p. 138, pl. 240, fig. (c). Boats now used in Germany and France, propelled by a square board on a pole (like a mud rake) drawn inwards. Greenland boats of fish skin on fish bones, Nicolo's Voyage in A.D. 1380, in Purchas's Pilgrims, vol. 3, p. 610, also of sealskin propelled by a double paddle, ibid., pp. 817, 835. Boat on shallow water, moved by a plough drawn by two horses (to stir up the soil), a man in the boat directs the plough Lupold's Theatrum Machinarum Generale, Leipsic, 1724, vol. 2, pl. 23. In the "Mexican History in pictures," sent to Charles V., are drawings of a boat propelled by a man standing with one paddle, Purchas's Pilgrim's, vol. 3, pp. 1106, 1109, 1110. A leather skiff, propelled by a woman working a paddle with one hand, and holding an umbrella-like sail with the other, is represented in Lupold's Theatrum, &c., vol. 7, 8, tab. 2. The operation called "sculling," (perhaps from "Scylla" a swift trireme. J. Scheffer de Militari Navalis Upsaliae, 1654; Polenus' Thesaurus, tom. 5, p. 820,) is performed with one oar, which turns in a groove at a boat's stern; the axis of the oar describes a figure 8 in the water, and the blade is turned edgeways as it nears the boat, and broadways when it goes the other way. Chinese junks are propelled by sweeps, each has an indentation underneath, by which it turns on a pin fixed on a beam projecting over the junk's side; the sweep is worked so as to scull (as described above), Captain Fishbourne, R.N. (A.D. 1857); Chesney's Expedition, vol. 2, p. 650; see native model in the United Service Institution Museum, No. 2560. "Very great oares after the manner of China, which serue and are managed as fishes use their tayle," Diego's letter from Paquin (Pekin), A.D. 1602, in Purchas's Pilgrims, vol. 3, p. 354 (where the Chinese boats are described at length). At Naugasaque, in the Indian Ocean, "their oares resting upon a pinne fastnd on the topple of the boat's side," ibid., p. 366. The ancients used the oar nearly vertically; Hooke's lecture in A.D. 1684; Bourne on the Screw Propeller, 2d edition, London, 1855, p. 6; oars in Kataia (India), worked by four men, in A.D. 1271, Marsden's Marco Polo, p. 566; vessels moved by thirty rowers on each side, standing with their faces to the bows, Histoire de Tunquin, Paris, 1666, p. 122; a similar use of the oar by men standing, Stenitz' Ship, London, 1849, Appendix, p. 16. Columbus says that he found in the West India Islands boats with seventy or eighty oars. Columbi Epistola (by Brant), 1495, e.e. iij. Oars used as rudders are described note (*a*), p. 8, *post*. For further information on the subject of oars and rowing, see Isaiah, xxxiii. 21, and xliii. 14 (boatman's song); Ezekiel, xxvii. 6, 26, 29; Jonah, i. 13; Mark, vi. 48; John, vi. 19; Woodcroft's MS. collection (in the Great Seal Patent Office library); Lacroix' le Moyen Age, &c., 5 tom., Paris, 1849; tom. 2, Marines; also the authorities cited at folio 19 of the same; Lazari Bayfii Annotationes, Basileae, 1536; Archeologie Navale, par A. Jal, 3 tom., Paris, 1840; Montfaucon's L'Antiquité Enpliquée, 4 tom., Paris, 1819; J. Schefferi de Militari Navalis (in Polenus' Thesaurus), Upsalae, 1654; Fincham's History of Naval Architecture, London, 1851; Dissertation on the Ships of the Ancients, in Smith on the Voyage and Shipwreck of St. Paul, London, 1848, p. 140; Talbot's Analysis of the Bible. Leeds, 1800, chap. vi. (Navigation); Potter's Antiquities of Greece, 2 vols., Edinburgh, 1832, vol. 1; Vincent's Navigation, vol. 2; Dissertation 2 on Ezekiel, ch. xxvii. at p. 619; Layard's Nineveh, vol. 2, p. 389.

(*a*) Lucan, l. 4, v. 130; Humane Industry, p. 146; Woodcroft's MS. collection. The Russians, or Northmen, were conveyed in the Carabus, Luitprand, lib. 5. cap. 5, de Rebus imperatorum, Jal, tom. 1, p. 411; Montfaucon's L'Antiquité, &c., tom. 4, p. 219. Carabus may be derived from "Carabe," crab, which has eight legs, like eight oars, Jal, ibid. Scheffer mentions an ancient author, who speaks of Carabus as if it were part of a ship, and he suggests it may mean a leather or wicker end of a boat (drawing); but he says, he knows of no case in which it is described; J. Scheffer, in Polenus' Thesaurus, tom. 5, p. 830. (Perhaps it may mean here the same as "Corbis," the basket at the top of the mast; see next note.) Two of the vessels, used by Columbus were called Caravels; Church-

Pliny tells us that the ancient Britons used a similar boat (*a*), and boats of this kind (called Coracles) are now employed on the Severn and elsewhere (*b*).

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hill's Voyages, vol. i. p. 36. Robertus Valturius gives drawings of a boat of wicker covered with hides. It is made in three compartments, which are united by hooks and eyes to form a pontoon, and worked by six oars (De Re Militari). Chinese vessels in fourteen compartments, in A.D. 1271, Marsden's Marco Polo, p. 566.

(*a*) Pliny, lib. 8, cap. 56. Cæsar used them in Spain after seeing them in Britain, Cæsar de Bell. Civ., lib. 1, sec. 54. Coracles are now used, Charnock's History of Marine Architecture, vol. 1. p. 222, note, called "Corraghes" in Ireland, in Welsh, Cwrwgle; Humane Industry, p. 146; Vallancy's Vindication of the Ancient History of Ireland, Introduction, p. 27; Chesney's Expedition, vol. 2. p. 64. "Almost all ancient cities of Asia Minor and the adjacent islands whose names commenced with 'Cor' stood upon the sea coast," Layard's Nineveh, vol. 2, p. 387 (note). The word meaning basket contains 'Cor' in many old and modern languages, Webster's Dictionary. "Corbis unde Corbitæ," denoting the basket round-top on the mast, Bayfii, p. 145; see also preceding note. Other constructions of boats may be referred to, such as rigged rafts, Charnock's History, &c., vol. 1, p. 12, (model in Chinese room, British Museum.) Egyptian earthenware rafts, Juvenal Sat. 15 (these are still used). Egyptian reed boats (being built), Lepsius' Denkmaeler aus Aegyptian und Ethiopien, band 3, bl. 12; Description de l'Egypte, 24 vols., Paris, 1821; Atlas vol. 5, pl. 18, fig. 7. Arab boats of tortoise shell; Humane Industry, p. 150. Original Egyptian boats of planks, three feet square, fastened with pins, Charnock's History, &c., vol. 1, p. 5. Ships in Livonia sewed with osiers, Purchas's Pilgrims, vol. 3, p. 628; the same in Greenland (in A.D. 1564), ibid., p. 652. Reed boat for getting asphalte; Diodorus S. (lib. 19.), quoted in L. Bayfii Annotationes, Basileae, 1536, p. 103. Boat with bulwark of basket-work in Brazil at the present day, Illustrated London News, A.D. 1857, April 11, p. 330 (drawing). Boat from a tree, hollowed, invented by the Germans, Pliny, lib. 16, cap. 31; used by the Gauls, Livy, lib. 21, c. 26; and by the Rossi or Russians, Charnock's History, &c., vol. 1, p. 245; Purchas's Pilgrims, vol. 3, p. 777; to this the Cossacks added planks above, ibid., p. 249; Vincent's Navigation, vol. 2, p. 521. Dr. Livingstone found the same use of trees in Central Africa. Sides or bulwarks of mud are used on the Nile boats. Boats of planks sewn together, see native model of Massullah boat, No. 2,570, in the United Service Institution Museum; also model 2,575. Short planks sewed transversely, see model (without a number) in the same Museum. Brass fastenings used in Nero's time, Vegetius, lib. 4, cap. 34. Leather sheathing over pitch, and sheet-lead sheathing, Charnock's History, &c., vol. 1, p. 100; double sheathed vessels, Marsden's Marco Polo in A.D. 1271, p. 566; "Curricurre" boat, Herbert's Travels, 3rd ed., London, 1677, p. 349 (drawing); Chinese discovery of the Compass, Paper by Lord Macartney, Vincent's Navigation, appendix, dissertation 3; Encyclopedia Metropolitana, 1845, article 'Sunda Islands,' p. 245. Philosophical Transactions, 1697, p. 590; Harleian Voyages, vol. i, p. xxii.; Churchill's Voyages, vol. i, p. xiv. Plinander says that the compass was discovered by Gioia, an inhabitant of Amalphi, "Non ita multis retro seculis," (but about the year A.D. 1300, Churchill's Voyages, vol. i, p. 16,) and adds that Plautus is supposed to refer to the compass under the name of "versoria;" Plinandri in decem libros Vitruvii Annotationes, Romae, Jo. And., Dossena, 1544, p. 356. Other authors consider this word meant a rope for turning the yard. The compass is alluded to in Chaucer, but probably not the mariner's compass, mentioned in England in A.D. 1345, Steinitz' Ship, p. 149. Before its discovery the sailors sent out birds to find the position of the land. Three ravens used for this purpose in the voyage of Floco, Steinitz, p. 41; Genesis, ch. viii. v. 7–12; Pliny, Humane Ind., p. 160; Voyages to America in 10th century, Antiq. Amer. Hafniae, 1837. A wheel log, Vitruvius, x. 14 (drawing). See note (*d*), p. 7, *post*.

(*b*) See a drawing in the Children's Paper, London, May 1, 1857. "Etiam nunc in Brittanico oceano vitiles corio circumsutæ fiunt," L. Bayfii Annotationes, 1536, p. 102.

The use of sails for propulsion on water by the action of air is of an unknown antiquity (*a*).

Various means were long ago devised for propulsion on water by the use of the land, besides towing from the bank or punting against the bottom of the water.

The Chinese crossed rivers by floating on the water, and drawing themselves along a rope fixed at each end (*b*).

The method of navigating streams by dragging a weight behind a vessel descending them was used on the Nile (*c*). It is now employed on the Nile and Euphrates (*d*), and commonly in Europe (called kedging).

The Chinese, in ancient times, used a vessel propelled by paddle-wheels on each side (*e*).

" In some very ancient manuscripts extant in the King of France's " library, it is said the boats by which the Roman army under " Claudius Caudex was transported into Sicily were propelled by " wheels moved by oxen. And in many old military treatises the " substitution of wheels for oars is mentioned " (*f*).

(*a*) See sculptures from Egypt, Assyria, Greece, and elsewhere, in the British Museum; also, Isaiah, xxxii. 23; Ezekiel, xxvii. 7; Woodcroft's MS.; Fincham's History of Naval Architecture; Varro, lib. 5.; Charnock's History, &c. vol. 1, p. 116. The inventions relating to sails are not included in this compilation of Abridgments, but will be detailed in a separate series.

(*b*) Mémoires des Chinois, &c., vol. 8, p. 358, pl. 13, fig. 54. Boats were passed by machinery from one level of a canal to another in China and Flanders, Fulton's Treatise on Canal Navigation, London, p. 6; Phillips on Inland Navigation, London, 1792, p. 13. "Ships of Magistrates" were drawn against the stream in the Yellow River, by machinery on shore, Purchas's Pilgrims, vol. 3, p. 341.

(*c*) Herodotus, 2, 96, Blakesley's edition, note 259.

(*d*) Chesney's Expedition, vol. 2, p. 640; Charnock's History, vol. 1, p. 5.

(*e*) See this described, under A.D. 1778, p. 31, *post*. Paddle-wheels appear to be represented in a woodcut in a book on shelf 3, press 4, of the 500 Chinese volumes of Dr. Morrison, in University College Library, London. For a notice of a Chinese model of a screw propeller, see Thomson's Annals of Philosophy, vol. 12, p. 246; also Bourne on the Screw Propeller, p. 1; also p. 25, *post*.

(*f*) Stuart's Anecdotes of Steam Engines, 2 vols., London, 1829, vol 1, p. 97; Appius Claudius, called 'Caudex," because he used boats (caudices) in war, Aurel. Vict. de Vir. Illust. c. 37; Seneca de Brev. Vit. c. 13 (Facciolati). He was consul 263 B.C. Le Antichita della Silicia, 4 vols., Palermo, 1834, vol. 1, p. 56. Lazari Bayfii Annotationes, Basileæ, 1536, p. 142 (British Museum). Thesaurus of Antiquities of Sicily, 1725, vol. 13. Cattrou and Rouille's History of Rome, 5 vols., fol., London, 1739, vol. 2, p. 539. But by none of these writers does the use of the wheels appear to be mentioned. The use of paddle-wheels by the Egyptians and the ancient Chinese is alluded to in Scott Russell on Steam and Steam Navigation, London, 1841, p. 182, note. Steinitz' Ship, p. 405. After diligent search and inquiry at the British Museum, it is believed this use in

In A.D. 1472, R. Valturius gives a view of war galleys moved by wheels instead of oars. The wheels are on each side of the vessel, connected by an axle with a crank in the middle (c).

In A.D. 1543, Blasco de Garay, a Spaniard, is claimed to have propelled the vessel "Trinidad" at Barcelona, by an engine which "consisted of a large cauldron or vessel of boiling water and a "movable wheel attached to each side of the ship" (d).

Egypt is not depicted on monuments or papyri. Perhaps an Egyptian chariot wheel (in drawing, [illegible]) of Lepsius' Denkmaeler, &c., was mistaken by a [illegible], for we find that the wheels represented as carried on ships in the slabs from Nineveh ([illegible]) are not those of machinery, but of chariots. Sir H. Rawlinson and Dr. Layard state (A.D. [illegible]) they have not seen indications of marine propelling machines in the Assyrian remains. The use by the Carthaginians is mentioned in Bourne on the Screw Propeller, 2nd edition, London, 1855, p. 3. See also [illegible] Industry, p. [illegible]. Paddle-wheels turned by oxen are described in [illegible] lib. x, [illegible] cap. 3, quoted in Polenus' Thesaurus, Venice, 17[illegible], vol. 5, p. [illegible], referring to Scheffer's four books "De Re Navali Veterum."

(c) De Re Militari, lib. x, p. [illegible], Verona, 1472 (the copy in the British Museum library has no pages or chapters numbered). Drawings are given in it of a double-[illegible] boat, with five pairs of paddle-wheels turned by cranks, connected by a rod or cord, also of other forms of rafts, boats, and pontoons. Oars were used in large vessels for a long time after this. In A.D. 1492, Christopher Columbus used a vessel propelled by oars and sails in his first voyage to America. (Columbus de Insulis nuper inventis Epistola, 1493 (a black-letter copy in the British Museum Library). A drawing of this vessel represents a galley with one mast and a yard and 16 oars on one side; a small boat worked by one oar, conveys two men to the shore, where the natives of "Insula Hyspana" are represented as meeting the travellers. The same woodcut is used in another edition of Columbus' Letter by Brant, A.D. 1495. The vessels used by Columbus are described as "Liburnicam unam et caravelas duas" with which he left Spain Sept. 1, A.D. 1492. See Novus Orbis id est Navigationes Primæ in Americam, Roterdami, 1616, p. [illegible] (British Museum); also Bayfii Annotationes, Basileæ, 1536. The "Liburnia" is variously described, but the term seems to have been used to designate "a swift vessel." Lazar. Bayfii, p. [illegible], where a drawing represents a vessel propelled by many oars arranged in rows: Montfaucon's L'Antiquité Expliquée, tom. 4, p. 21[illegible], Jal's Archéologie Navale, tom. 3, p. 470. Liburnum, or Liburna, or Liburnica, means a vessel for war of the fastest kind, Stephanus Doletus de Re Navali, Lugduni 153[illegible], p. 65. Pliny says, that the Nautilus or Pompilos imitates the Liburnæ, (Lib. [illegible], cap. 29) for lying on the water, it propels itself by expelling water from a tube. Bayfii, p. [illegible]; for a further reference to the Liburna, see note (d), post, p. 7. The vessel called 'Celo,' (Greek '[illegible],' Latin 'celox,' Norman 'chiule,' English 'keel,' 'yawl'), was a one oared [illegible] (from Greek 'keles' 'equus,' Bayfii, p. 93, et seq.) Stephanus Doletus [illegible] describes it as a swift (celox) small vessel used by pirates. Scheffer says '[illegible]' is a boat in which each man uses one oar, Polenus, p. 819. The Saxon [illegible] landed in England in three ships called 'chiules,' Hasted's History of [illegible] Canterbury, 1778, p. 28. "Edgar was rowed on the Dee by eight tributary [illegible]," Selden, Mar. Claus., fol. 258; Charnock's History, &c., vol. 1, p. [illegible]. [illegible] seems to have used only sailing vessels. See the plates in [illegible], Lisbon, 1604 (British Museum).

(d) [illegible] Stuart's Anecdotes of Steam Engines, vol. 2, p. 435 (note). Scott Russell [illegible] and Steam Navigation, p. 223; Woodcroft on Steam Navigation, [illegible] p. [illegible]; Fincham's History of Naval Architecture, p. 277, where [illegible] of the trial of the vessel, purporting to be extracted by T. Gonzales from official papers will be found. See also Des Bateaux à Vapeur, [illegible] Achille de Jouffroy, Paris, 1841, p. 7; Dictionnaire des Inventions, [illegible] Art. Vapeur; Steinitz' Ship, p. 402. The engine may have [illegible] of Hero's plans, p. 23, post, note (g).

J. C. Scaliger (who died A.D. 1558) published, at Frankfort, a short notice of a vessel to be propelled without oars (*a*).

In A.D. 1578, W. Bourne, an English writer, says: "And, " furthermore, you may make a boate to goe without oares or sayle, " by the placing of certain wheeles on the outside of the boate in " that sort that the armes of the wheels may goe into the water, and " so turning the wheeles by some provision, and so the wheeles " shall make the boate goe" (*b*).

In A.D. 1582, J. Bessoni describes a vessel with two prows, between which a frame is suspended on pivots. A long spar or lever projects upwards from the frame, and at its lower end carries a circular reel like a cask, which also turns on pivots. The lever is moved to and fro in the direction of the vessel's length by ropes led to a winch, and thus the frame, which is balanced, acts against the water, the cask turning on the pivots during the return stroke (*c*).

Pancirollus, a professor at Padua in A.D. 1587, mentions that he saw an ancient bas-relief which represented a galley with three wheels on each side turned by three pair of oxen (*d*).

(*a*) The words used are "Naviculam sponte mobilem ac sui remigii Autorem faciam nullo negotio," Julii Cæsaris Scaligeri Exot. Exercit, &c. Franco, 1665. Exercit ad Cardanum 326, p. 1005.

(*b*) "Invention or Devises," by William Bourne, London, 1578, p. 15.

(*c*) Abridged from a translation in Woodcroft's MS. collection. In A.D. 1572, double boats were described moved by oars, and used in ancient times for carrying battering rams. Heronis Mechanici liber de Machinis bellicis Venetiis, 1572, p. 44 (drawing).

(*d*) The copy of Pancirollus in the British Museum library is entitled "Rerum " Memorabilium olim deperditarum (&c.), a Guido Pancirollo Ambergæ, 1599." He says, "I have seen a certain representation of ships they call Liburnæ (a " Liburniâ regione inter Illyriam et Dalmatiam sitâ, p. 246), which have three " external wheels on each side touching the water, each of them furnished with " eight boards projecting a palm breadth from the wheel. Six oxen inside, by " working a machine, turned the wheels, and the spokes striking the water " backwards, moved the Liburna with such force on its course that no trireme " galley could resist it." p. 242. Vitruvius is referred to for the above notice in " Humane Industry," (London, 1661,) p. 154. Several authors allude to notices of paddle-wheels in Vitruvius, but it is probable that they have supposed his plan for indicating a vessel's speed by a wheel turning in the water to be a description of a wheel for propelling the vessel. The paddle-wheel indicator is described in Vitruvius, lib. 10, ch. 14. A drawing, representing the wheel outside the ship's side (as it is explained by Vitruvius), is given in Newton's edition, London, 1791, and a similar drawing (representing a wheel, at least thirty feet in diameter,) is in the Basel edition, A.D. 1548. The text of Vitruvius mentions the wheel as 4½ feet in diameter. The edition published at Venice in A.D. 1522, shows the wheel inside a trough in the middle of the boat (a copy of this is in the possession of Mr. T. L. Donaldson); the same drawing is used in

In A.D. 1588, A. Ramelli describes a pontoon or locomotive bridge. "This bridge is made, as shown in the design, tight and "well covered, like a boat, so that the water cannot penetrate; "but it has its bottom flat, in order to float lighter on the water; "moreover, it has behind, like vessels, a rudder (*a*), with which

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the Italian translation, A.D. 1522, and in the Lyons edition, A.D. 1523. No drawing is given in the Amsterdam edition, A.D. 1649, the Florence edition, A.D. 1496, or Philander's notes, A.D. 1544. The copy of the Perugia edition, A.D. 1536, in the British Museum library, contains only five books. For a description of the Liburna, see note (*a*) p. 6, *ante.* A modern plan for propelling vessels by horses or elephants is referred to in Mechanics' Magazine, vol. 66, No. 1,760 (May 2, 1857), p. 416.

(*a*) The invention of the rudder is of an unknown antiquity. In the Nineveh marbles the use of a steering oar at the quarter is depicted. In the Egyptian monuments steering oars of various kinds are sketched. In most cases one oar at the quarter was used. For the use of three or more on one side, see Wilkinson's Egyptians, 3 vols., London, 1837, vol. 3, p. 205. Description de l'Egypte, 24 vols., Paris, 1821, vol. 4, pl. 65, fig. 3. Papyri, 828 and 829 (Salt), on the staircase of the British Museum. Three rudders (one in the middle) used in Siam, Montfaucon's L'Antiquité, &c., vol. 2, p. 82, (quoting Crescentius, c. 8). Two steering oars used obliquely; sketch in Musæo Borbonico, Lacroix' &c. Marines, vol. 14. The flying proa of the Ladrones (convex on one side, and wall-sided on the other), with a floating outrigger to windward, is steered by one oar, Knowle's Naval Architecture, 3rd edition, p. 116 (drawing in pl. F. fig. 3.) The canoes on the Zambesi, in Central Africa, are thus steered (Dr. Livingstone). Barges on the Rhine and Rhone are steered by a tree with its branches in the water. In an ancient Egyptian painting, a ring or enclosed rowlock holds a steering oar on the quarter, Lepsius, band 3, bl. 28. Oar resting in a groove on the stern-post, band 5, bl. 10 (a); with a hooked "button" on the oar, bl. 76; with a "button" on the stern-post, band 4, bl. 126; the oar slung behind the stern-post, bl. 127. Each quarter oar supported on an upright, eight feet high, between which sits the steersman working the oars by cords, bl. 127; or by uprights, Model 513* (Salt's Catalogue), in the Egyptian room, British Museum, or as in Model 514*, by a cross-piece in his hands. (The operation of this apparatus is not very evident, although represented in these unique models and in numerous paintings). A cross-piece as a tiller on the top of the oar, band 2, bl. 101, gr. 22 (b); two oars at the quarters, with a tiller on each held by a man's hand, Jal, vol. 1. p. 23, also p. 185; the same on a Roman vessel in the Borghesi Collection, Steinitz, p. 33, pl. 4, figs. 7 and 10. A rudder on the quarter, with a tiller in a Saxon vessel, Fincham's Naval Architecture, p. 12, pl. 6; rudder, with a hole to sling it by, and a tiller used in Japan, Chinese and Japanese Dictionary (drawing) in the British Museum; a rudder, abutting on a pin near the water, on the quarter, used by Richard Cœur de Lion, Steinitz, pl. 10, fig. 10; "Pericles. the Athenian, first used apparatus for steering at the stern," "exemplum a piscibus tractum est qui caudâ reguntur," R. Valturius, A.D. 1472. The rudder first hung on pintles in A.D. 1328, Steinitz, p. 122 (drawing). A vessel with two masts, and steered by oars at each end on opposite sides, was used in the time of Columbus. Columbi Epistola, 1493, (where there is a drawing opposite p. iii.) A rudder worked by ropes without a tiller found on a vessel dug up in Kent, 500 years old, see "A description of the ancient vessel recently found under an old branch of the River Rother," London, 1823, p. 5. Ferry boats moored on the Rhine cross by action of a rudder.

Lacroix derives "starboard" from "Styr bord" the side of the vessel for the "Styr," or oar to steer by, and says this was always on the right-hand side. He represents the seal of Paris to prove this (folios 14 and 19), and considers the seal of Dover (fol. 16) as representing the steering oar on the port side by mistake; Lacroix, Le Moyen Age, &c., tom. 2, Marines. Jal says, "starboard" is from "Styrbord" or from "Dextri bord" the "right side," Archeologie, &c., tom. 1, p. 182. For the mariner's compass, see note (*a*), p. 4, *ante.*

they steer it, and on each side is a wheel (noted S. and T.) which serve for oars, being turned by one man, with a winch handle" (a).

In A.D. 1597, Roger Bacon said, "And first of all, by the figuration of Art it selfe, there may be made instruments of Navigation without men to rowe in them, as huge shippes to brooke the sea, onely with one man to steere them, which shal saile farre more swiftly than if they were full of men."

He then goes on to notice submarine instruments: "Moreover, instruments may be made wherewith men may walke in the bottome of the sea or river without bodily danger, which Alexander the Great used to the end he might behold the secrets of the seas, as the Ethick philosopher reporteth, and these have bin made, not onely in times past, but even in our days" (b).

The same writer tells us that many instruments of this kind are related to have been invented in England, and that one Thomas Norton used to sit in his boat reading or writing while it was propelled at a high speed. "We have seen and used in London a warlike machine driven by internal machinery, either on land or water. Succeeding years have shown us a vessel, which being almost wholly submerged would run through the water against waves and wind, with a speed greater than that attained by 'Celonibus Londinensibus expeditissimis'" (the fastest London pinnaces, Facciolati). He adds, that machines for walking under water were used abroad for getting pearls from the bottom of the sea (c).

In A.D. 1607, a plan was described for working oars by attaching to the inside ends of their looms, a beam worked by a wheel turned by a winch handle (*a*).

(a) See "Le diverse et Artificiose Machine del Capitano Agostino Ramelli," a Parigi, in casa del autore cõ privilegio del Re, 1588.

(b) The Mirror of Alchimy, &c. of the admirable force and efficiency of Art and Nature, by "Roger Bachon." London, 1597, pp. 64, 65. The first publication of this was in A.D. 1542.

(c) Translated from Epistola Fratris Rogeri Baconis de Secretis, &c., Hamburg, 1598, pp. 74, 75. A Latin copy of this work is bound up with the copy in the British Museum Library of the book by R. Bacon, referred to in the preceding note

In the 17th century, Van Drebbel, at the command of James I., tried on the Thames a submarine vessel with twelve rowers, besides passengers. The vitiated air was revived by a liquid (*b*).

A.D. 1618, January 17.—N° 6 (*c*).

RAMSEY, DAVID, and WILDGOSSE, THOMAS.—" Divers " new, apte, or compendious fórms or kinds of engines or instru- " ments and other pfitable invencõns, wayes, & meanes" to plough ground, to enrich land, to raise water, "and to make boates for " the carryage of burthens & passengers runne upon the water as " swifte in calmes and more saff in stormes than boats full sayled " in great wynes."

[No specification enrolled. The patent is in an unusual form. A copy may be seen in the Great Seal Patent Office library. See also Woodcroft on Steam Navigation, p. 3.]

A.D. 1630, January 21.—N° 53.

RAMSEYE, DAVID.—1. "To multiply and make saltpetre in an " open field, in four acres of ground sufficient to serve all His " Ma$^{\text{ties}}$ Dominions."

2. " To raise water from lowe pitts by fire."

3. " To make any sort of mills to goe on standing waters by con- " tinual mocõn, without the help of windes, weight, or Horse."

4. " To make all sorts of Tapestry without any weaving loome " or way ever yet in use in this kingdome."

5. " To make Boats, ships, and Barges to goe against the wind " and Tyde."

6. " To make the earth fertile more than usuall."

7. " To raise water by a newe way."

8. " To make hard from softe, & copper to be tuffe & softe, & to " make yellow wax white very speedily."

[No specification enrolled. See Woodcroft on Steam Navigation, p. 4.]

(*a*) Nautica Mediterranea de B. Crescentio Romano, Roma, 1607, p. 49, (where the drawing represents three oars on one side thus worked).

(*b*) Chambers's Cyclopedia, 4 vols., London, 1788, vol. 2, art. " Diving Bell."

(*c*) The number refers to that affixed to the Patent in the various indexes and reference books at the Great Seal Patent Office. When the Specification of a patent has been enrolled, the number is given on each printed copy.

A.D. 1632, July 20.—N° 59.

GRENT, Thomas.—1. "An instrument very profitable when "cõmon Wynds fayle for a more speedy passage of calmed shipps "or other vessels upon the sea or great rivers, which may be called "The Wynds Mãty."

2. "A fish call."

3. "A water Rowe, being a manuall instrument made very "serviceable for divers uses, especially for the more speedy pre-"servation of houses upon the land & ships upon the sea from "sudden Fire."

4. A mould to be used in building.

5. "A moveable Hydraulicke or chamber weathercall," a musical instrument.

6. "A corrected crane," for transfusing liquors.

[No specification enrolled. See Woodcroft on Steam Navigation, p. 4.]

A.D. 1634, July 18.—N° 73.

BULMER, John.—"Engines and invencõns for the takeing upp "of shipps & goods suncke in the sea, and useing them accord-"inge to his owne wayes."

[No Specification enrolled.]

A.D. 1636, April 27.—N° 92A.

VAN BERG, John Christopher.—1. "Diverse mechanicke "instruments and frames operating by waights, so to be fitted & "ordered that the force & strength of them may be augmented or "diminished, either in regard of the instruments themselves or in "respecte of the number of workmen to be ymployed about them, "accordinge as occasion or necessitie shall require; which instru-"ments or frames may be exercised by land, either below on the "ground or on highe alofte, as well within as without any build-"ings, and likewise by water in shipps, pontes, boates, & shallopps "for the effectinge any such thinge or things as may neede lifting "or heaving upp, letting or draweinge or halinge from place to "place, transporting, forcible strikeing in, pullinge forth, beatinge "downe, battering, pressing, plateinge, or squeesing."

2. Machines for weighing, working bellows, raising water, measuring land, sounding water, and for carriages & harness.

3. "Other instruments whereby any shipp receaving a leake "may be p̃served from sinkeinge till ytt may bee brought to shore "to be amended, or in case such shipp of necessitie muste sincke, "then whereby a signe may be extant above the water to shewe "the place where itt suncke, that soe instruments may bee applyed "for the drawceinge itt vpp againe, with an assured way howe the "very greateste shipp may bee drawne vpon agayne thoughe itt "bee suncke eightie fathomes deepe."

4. Machines for removing earth from shallow water, working timber, warming the body, threshing corn, a laundry house, building houses, building ships.

[No Specification enrolled.]

A.D. 1637, September 6.—N° 109.

LIN, FRANCIS, YORKE, HENRY, and MYLES, FRANCIS.—"To use & exercise upon the River of Thames, & any other River "within England & Wales, accordinge to their owne way & Invenc̃on, the Sole drawinge & workinge up of all Barges & other "Vessells without the use of Horses."

[No Specification enrolled. See Woodcroft on Steam Navigation, p. 5.]

A.D. 1640, March 14.—N° 126.

FORD, EDWARD.—"A way for a more speedy, thrifty, & safe "passage & navigac̃on of boates & vessells upon navigable rivers, "as also of all little shipps of good burthen, in & out of havens, "whereby wee can make all boates, barges, & lighters to goe faster "against wynd and tyde then nowe they use to doe with halfe the "men they have formerly vsed, & with very little (yf any) vse of "horses or men for towing of such vessells on the shoare side, "whereby halfe the charge of men & neere the whole (if not all) "charge of horses wilbe saved, and vessells may pass against wynd "& tyde, and when the rivers overflowe the banckes, and alsoe the "owners of grounds adioyning to navigable rivers may enioy them "more private to theire greater benefitt; & the sd Edward Ford, by "the same way, cann bring in little shipps, barges, & vessells in & "out of havens without or against any small wynd or tide, & cann "transport souldiers or passengers without or against wynde yf "the seas be not rough."

“ And the said Edward Ford hath further by his said petic̃on
“ informed vs that his said invenc̃on will never any way hinder the
“ old way of sayling, but may on many occasions be added thereto
“ for the speed of sayling, and may at any tyme be layde aside in
“ a corner of the shipp, and quickly added agayne when neede
“ shalbe.”

“ The way whereof, hereby declared by the said Edward Ford,
“ for the effecting of the particulars above menc̃oed being partly
“ by newe fashioned oares, whose fynnes open & shutt, and are to
“ be applyed to the vessells that shall vse the same in a newe way
“ not hitherto vsed, and partly by wheeles & other engines turning
“ about axletrees, and placed in & about the vessells in such
“ manner as hath not hitherto brought to any effect by any
“ others.”

[No Specification enrolled. See Woodcroft on Steam Navigation, p. 5.]

In A.D. 1659, I. de Caus described a canal lock, similar to that now used, and which he saw between Venice and Padua (*a*).

A.D. 1661, February 8.—N° 131.

WORCESTER, Edward, Marquess of.—1. Relates to watches and clocks.

2. Relates to guns and pistols.

3. Relates to carriages.

4. “ Lastly, an invention to make a boate that roweth, draweth or
“ setteth even against winde or streame, yea both, and to any part of
“ the compasse, which way soever the streame runs or wind blowes,
“ and yett the force of the wind or streame causeth its moc̃on,
“ nothing being required but a steersman, and whilst the boate
“ stayeth to be loaded or unloaded the streame or wind shall per-
“ form such work as any watermill or windmill is capable of.”

(Extract from the Signet Bill, dated 15th November A.D. 1661.)

[No Specification enrolled. See Register of Arts and Sciences, vol. 3, p. 237. Stuart's Anecdotes of Steam Engines, vol. 1, p. 41. Woodcroft on Steam Navigation, p. 5.]

A.D. 1661, May 16.—N° 132.

TOGOOD, Thomas, and HAYES, James.—“ A newe in-
“ venc̃on of forceing water by bellowes, not done with wind, as

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(*a*) New and Rare Inventions of Waterworks, by I. de Caus, translated by J. Leask, London, 1659, p. 34 (drawing).

" alsoe the draweing it vpp with leatherne baggs linked togea-" ther in manner of bucketts where the bellowes cannot be placed, " which may be for the publique benefitt of shipping, drayning " of mines, bringing water to houses, emptying of rivers or ponds, " drayneing & watering of grounds, or any way of pumping " water, together with a particular way of forceing water through " the bottome or sides of shipps belowe the surface or toppe of " the water which may be of singular vse and ease in navigac̃on, " & was never before publiquely done or vsed within any of our " kingdomes, Dominions, or Territories."

[No Specification enrolled. See Woodcroft on Steam Navigation, p. 7.]

In A.D. 1661, "There have been boats made here in England " to go under water." (*a*).

A.D. 1662, August —.—N° 139.

TOGOOD, Thomas, and **HAYES**, James.—"Severall new " invenc̃ons by them found out for the making of shipps to saile " without the assistance of Winde or Tyde; and also, a certain " instrument for taking of the way or course of any Shipp with " demonstrable exactness."

Raising water from mines.

[No Specification enrolled. See Woodcroft on Steam Navigation, p. 7.]

On April 3, A.D. 1663, an Act of Parliament was passed granting to the Marquis of Worcester, and his successors, the whole of the profits that might arise from the use of an engine described in the last article of his "Century of Invencions," on the "simple " affirmation of the discovery that he had made." From the description this engine appears to have been a boat with paddle-wheels on an axis across it, which axis is turned by the action of the stream on the paddles, and thus winds up a rope and draws the boat onward to the other end of the rope fixed by an anchor (*b*).

In A.D. 1663, Petty used a double ship with success (*c*).

(*a*) Humane Industry, London, 1661, p. 155, where the writer refers to Bacon's Novum Organum, lib. 2.

(*b*) See Woodcroft on Steam Navigation, p. 6.

(*c*) See Buchanan on Steam Propelling. Glasgow, 1816, p. 161.

A.D. 1667, October 8.—N° 154.

HOWARD, PHILLIP, and WATSON, FRANCIS.—"A certaine "way of graveing, garnishing, & colouring of shipps, barges, "wherryes, & other vessells, being their owne invencõn, and never "before used in this our kingdome, wch way of graveing will "p̃vent the eating of the worme & thereby save the sheathing, "being much more cheape & durable, & that the said way of "graving will make the sydes of the shipps or vessells that they "will bee more buayant, and sayle much faster."

[No Specification enrolled.]

A.D. 1668, February 18.—N° 157.

CHAMBERLAINE, PETER.—"Making severall sorts of vessells, "fabricks, small and greate, to navigate in a straite line with all "winds though contrary."

[No Specification enrolled. See Woodcroft on Steam Navigation, p. 7.]

In A.D. 1678, E. Bushnell described "a mode of rowing ships "by heaving at a capstan useful in any ships becalmed" (*a*).

In A.D. 1681, R. Hooke described windmills in which "we have "all the main features both of the screw propeller and feathering "wheel" (*b*).

In A.D. 1682, a horse "tow vessel" was used at Chatham, moved by paddles on an axle turned by horses (*c*).

In A.D. 1683, J. A. Borelli described a method of propulsion under water. A large metal vessel filled with air encloses a man's head, and is secured water-tight about his neck. A circular glass window is in front of his face. The air in the vessel is not renewed while the man is below water. Round his waist is slung a cylinder holding air, and furnished with a piston, moved by the hand, acting on rack work, so as to increase or diminish the volume of air in the cylinder, and thus enable the diver to raise or lower himself in the water, while webbed fins, with hooks attached to his feet,

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(*a*) See "Compleat Shipwright," p. 56, 4th ed. 1678.

(*b*) Bourne on the Screw Propeller, pp. 5 & 9.

(*c*) Savery's "Navigation Improved," p. 13. London, 1698. See a copy of this pamphlet in Woodcroft's Manuscript Collection; Stuart's Anecdotes of Steam Engines, p. 98; Woodcroft on Steam Navigation, p. 8.

enable him to "swim like a frog, or creep along the bottom like "a crab" (*a*).

In A.D. 1683, J. A. Borelli described a submarine vesssel, "navis urinatoria." It is a covered boat in which are several bags or skins, open to the exterior water, but closed otherwise.

By pressure on these bags, the water in them is partially extruded, and the volume of air in the boat thereby increased, so as to raise the boat from the bottom.

Oars at each side protrude through holes made air-tight by leather. The blades of the oars may be made to collapse, like a duck's foot. The writer says, that probably an easier mode of propulsion would be, instead of lateral oars, to use "only one "flexible and elastic oar, with a broad blade placed on the vessel's "stern, by the vibration of which the ship could be propelled as "fishes are by their tails" (*b*).

In A.D. 1688, D. Papin proposed to use gunpowder to create a vacuum under a piston in a cylinder, so that the piston would descend (*c*).

In A.D. 1689, D. Papin proposed to supply air from a skin to a diving bell (*d*).

In A.D. 1690, D. Papin described his steam cylinder; in which a piston descends by atmospheric pressure when steam below it is condensed. Among the uses to which this may be applied, he mentions the propulsion of ships by "remi-rotatiles," or paddle-wheels, such as he saw made in London, by order of Prince Rupert,

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(*a*) "De Motu Animalium," by J. A. Borelli, Romæ, 1681, quoted in Acta Eruditorum, Leipsic, 1683, p. 73 (drawing, tab. 3, fig. 5). This is described as the Campana Urinatoria, or "diving bladder," Lupoldi Theatrum, vol. 7, 8, tab. 2; and see Bacon's Novum Organum, lib. 2, § 50; also a paper by Jacob Bernouilli, disparaging Borelli's invention, in Acta Eruditorum, 1683, p. 553. The natatory organ of fishes and other marine animals enables them to rise and sink in the water by altering their displacement by a bag of air. The Nautilus Pompilius has several vacant chambers in the shell, which it fills with air or gas, and drawing its body forwards expands this gas so as to raise the shell to the surface. It is propelled by ejecting water. Owen's Lectures on the Comparative Anatomy and Physiology of Invertebrate Animals, 2nd edition, London, 1855, p. 579, fig. 214; Proceedings of the Royal Society, vol. 8, No. 25, p. 380 (a paper read Feb. 19, 1857). The use of the diving bell in Europe was first mentioned by John Taisnier, born at Hainault in A. D. 1509. Taisneri opuscula de celerrimo motu, quoted by Schott in his Technica Curiosa, lib. 6, cap. 9, p. 393; Beckmann's History of Inventions, vol. 1, p. 114 (note). A sea-fight at Malta, between Turkish divers (urinatores), in A.D. 1565, is described in Jal's Archeologie, vol. 1, p. 442.

(*b*) De Motu Animalium, by J. A. Borelli, Romæ, 1681, quoted in Acta Eruditorum, 1683, p. 76 (drawing, tab. iii., fig. 6). See also Acta Eruditorum, 1682 p. 354, where Borelli's work is mentioned as published at Rome in A.D. 1680.

(*c*) Acta Eruditorum, 1688, p. 497.

(*d*) Acta Eruditorum, 1689, p. 486 (drawing).

to be turned by horses. The axle of the wheels, he says, may be turned by several of his cylinders acting alternately by rack work, on a plan then well known (*a*).

In A.D. 1690, J. Wagensulius proposed the "hydraspis," a circular float embracing the body, and acting as a life buoy, while flat paddles, with leaves collapsing one way on the feet, enabled the wearer to swim (*b*).

A.D. 1692, February 28.—N° 290.

DUVIVIEN, ANTHONY.—"A very easy & not costly machine for making a ship go against wind and tide."

[No Specification enrolled. See Woodcroft on Steam Navigation, p. 9.]

A.D. 1692, March 24.—N° 308.

WILLIAMS, JOHN.—"A new engine (the modell whereof is "hereunto annexed) for the carrying of four men fifteen fathom "and more under water in the sea, whereby they may work twelve "hours togeather without any danger, which said engine will be "of great use and advantage for the takeing upp of wrecks & "shipps that have been and shall be lost in the sea" (*c*).

[No Specification enrolled. See Appendix to Reference Index of Patents of Invention, p. 41, where there is a Drawing of Williams' Invention, representing a tube open at the top above water and closed below. The men see through windows, and their arms protrude through water-tight sleeves.]

A.D. 1693, April 13.—N° 318.

STAPLETON, JOHN.—1. "A new and extraordinary engine of "copper, iron, or other mettall, with glasses for light, and joynts "so contrived as to permit a person enclosed in it to walke & "move freely with it under water, and yet so closely covered over

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(*a*) Acta Eruditorum, 1690, p. 410 (drawing), referring to the mode of using gunpowder proposed by him in 1688. See Memoire by M. Arago, in Annuaire pour l'an 1837, Paris, 1836, p. 245, *et seq.* Published first in A.D. 1828, and reviewed in the Quarterly Journal of Science and Art, vol. 5 (new series), 1829, p. 322. Sir Isaac Newton approved of this plan, but it was considered too expensive. Frazer's Magazine, vol. 38, No. 225, p. 276; Des Bateaux à Vapeur, par Jouffroy, p. 5. Papin was in England when Savery shewed his steam-engine to the Royal Society; Williams' Historical Account of Inventions, London, 2 vols., 1820, vol. 2, p. 456.

(*b*) Acta Eruditorum, 1690, p. 37. The drawing is in Supplementa, vol. 1, p. 40, tab. 2.

(*c*) The use of an apparatus similar to that described in the Specification was suggested by drawings in some editions of Vegetius (Lutetiæ apud, C. Wechelum 1532, fol., p. 180). These represent a tube open to the air above the water, and fitting closely on a man below, whose hands project through water-tight sleeves. For further information, see Beckman's History of Inventions, 2 vols, London, 1848, 4th edition, vol. 1, p. 111, et *seq*.

" with leather as sufficiently to defend him from all the jumps " of it."

2. Fresh air forced in "may be thence conveyed into large " vessells, whereby anything will be raised to the superfices of the " water to which the said vessels are fastnd."

3. Another engine, which will float, and being inverted and supplied with air, "a person therein may sinke to the bottom & " asscend again at pleasure."

4. " A way to defecate or purify the air, so as to make the same "again serviceable for resperac̃on."

[No Specification enrolled. See note to preceding Specification.]

In A.D. 1693, Du Quet tried a propeller "in which four oars " set in an arbor are made to revolve like a paddlewheel, and the " emerging float is feathered by being turned edgeways to the " water in its ascent" (*a*).

In A.D. 1693, a vessel of peculiar build, for carrying a battering ram or heavy weight, and moved by oars, is described as used in ancient times (*b*).

In A.D. 1695, D. Papin described a submarine vessel to be propelled by oars. Air is drawn in through a tube by "a Hessian pump," (a rotary flyer with vanes. Philosophical Transactions, 1697, p. 481.) The vitiated air escapes through another tube. A third tube enables the diver to use implements against an enemy's ship (*c*).

A.D. 1696, January 10.—N° 347.

SAVERY, Thomas.—" Millwork to grind & pollish looking " glasses, and coach glass plates, & marble stones; and also for " rowing of ships with greater ease & expedition than has hitherto " been done by any other."

It appears that the invention consisted in moving a paddle-wheel on each side of the ship by men turning round the capstan, and thereby giving motion through wheels to the axis of the paddles.

[No Specification enrolled. See Savery's "Navigation Improved," London, 1698; Woodcroft on Steam Navigation, p. 9; Thomson's Annals of Philosophy, vol. 18, p. 279.]

(*a*) Bourne on the Screw Propeller, p. 8; Buchanan on Steam Propelling, p. 57, where there is a drawing.

(*b*) Veterum Mathematicorum Opera, Parisiis, 1693; Athenæi de Machinis, p. 9 (drawing); see also note (*c*), p. 7, *ante*.

(*c*) Acta Eruditorum 1695, pp. 3, 76 (drawing, tab. 8, fig. 5). See a modern contrivance the "Nautilus" described in Journal of the Society of Arts, vol. 5, No. 224, March 6, 1857, where a plan by Herr Bauer is mentioned, and one by Dr. Payerne, carried into effect by Sir C. Fox and Mr. J. Scott Russell, p. 249.

A.D. 1698, July 25.—N° 356.

SAVERY, Thomas.—"Raising of water & occasioning motion "to all sorts of mills works by the impelling force of Fire (steam "engine)." In A.D. 1702, the patentee published the "Miner's "Friend, &c.," in which he says, referring to his invention: "I "believe it may be very useful to ships, but I dare not meddle with "that matter, & leave it to the judgment of those who are the best "judges of maritime affairs." And again: "As for fixing the engines "in ships when they may be thought probably useful, I question "not but we may find conveniences enough for fixing them" (pp. 32, 47).

[No Specification enrolled. See Transactions of the Royal Society for A.D. 1699, vol. 21, No. 253 (where there is a drawing); Harris' Lexion Technicum, &c., London, 1725, 4th edition, referred to in Farey on the Steam Engine, p. 105; Rees' Encyclopedia, London, 1819, article, Steam Engine; Woodcroft on Steam Navigation, p. 9; Register of Arts and Sciences, vol. 3, p. 252; Engineers' and Mechanics' Encyclopedia, vol. 2, p. 697; Stuart's History of the Steam Engine, vol. 1, p. 34; Stuart's Anecdotes of Steam Engines, vol. 1, pp. 102, 134; Partington on the Steam Engine, London, 1826, p. 183; Buchanan on Steam Propelling, p. 16; Ross on Steam Navigation, London, 1828, p. 5; Farey on the Steam Engine, p. 99; Acta Eruditorum, Leipsic, 1700, p. 29 (drawing) Annuaire pour l'an 1837, Paris 1836, p. 253. See also note (*a*) to Notice of D. Papin's invention, A.D. 1690, p. 17, *ante*, and Dictionnaire des Inventions, Bruxelles, 1838, art. Vapeur.]

In A.D. 1698, Savery published an account of another engine for rowing a ship by paddlewheels at the vessel's side (*a*).

In A.D. 1699, Du Quet appears to have tried revolving oars (*b*).

In A.D. 1702, Martenot described a mode of propelling a vessel against a strong stream by working a wheel against the bottom of a river. The wheel had projecting spokes, and was carried by a beam hinged to the vessel, so as to rise and fall with the inequalities of the bottom (*c*).

In A.D. 1703, Martenot proposed to use a wedge-shaped vertical propeller (*d*).

In A.D. 1703, De Camus described a plan for moving oars by a frame (*e*).

(*a*) Farey on the Steam Engine, p. 105; Receuil des Machines Approuvées. Paris, 1699, tom. 1, No. 54, p. 173 (where there is a drawing of these "Rames Tournantes").

(*b*) Woodcroft on Steam Navigation, p. 10. See pp. 20, 22, *post*.

(*c*) Recueil des Machines Approuvées, tom. 2, p. 26 (where there is a drawing). See also ibid., p. 141. Wheels for this purpose are now used between double boats on the Rhine and other rapid rivers.

(*d*) See Buchanan on Steam Propelling, p. 59 (where there is a drawing).

(*e*) Machines Approuvées, 1703, p. 49 (drawing).

A.D. 1706, June 6.—N° 377.

ALDERSEY, Robert.—" New invention in contriving a floating " dam to carry Lighters and other Vessels over the greatest Flats " & Shallows in any navigable River."

[No specification enrolled.]

In A.D. 1707, D. Papin used Savery's engine to propel a steamboat on the Fulda (*a*).

In A.D. 1707, Lavier proposed to propel a vessel by paddle-wheels turned by the stream and working bars with hooks pushing against the bottom (*b*).

In A.D. 1709, Conrad proposed to use paddle-wheels turned by wind (*c*).

In A.D. 1710, Chabert described a vessel with large paddle-wheels in troughs cut through the hull. A series of cables is applied to the shaft of the wheels, and being wound up by their revolution, the vessel is drawn onwards against the current (*d*).

In A.D. 1721, an account is given of experiments made in France with Du Quet's revolving oars. These paddle-wheels were 18 feet in diameter and three on each side of a galley were worked by 200 men (*e*).

In A.D. 1722, Drouet described a boat which draws itself to a fixed anchor, by paddle-wheels winding up the cable (*f*).

A.D. 1724, February 26.—N° 463.

DICKENS, John.—" New invented Machine, & new Method " by Floats, for raising great quantities of Water to supply Cities & " Towns, to Water Lands & Gardens, for Draining Mines & Fenny " Lands, for moving several sorts of Mill work, for moving Ships " & other Vessels, & for several other useful purposes."

[No Specification enrolled. See Woodcroft on Steam Navigation, p. 10.]

A.D. 1724, May 20.—N° 468.

DUNNING, Richard.—1. A floating water engine.

2. " A rowing engine, which, when fixed on board of any ship, " will force ships, of any burden whatsoever, against windes &

(*a*) Letters to Leibnitz, Dictionnaire des Inventions, Mignés N. Encycl., Paris, 1852, vol. 36, Art. Velopedes, p. 317.

(*b*) Acta Eruditorum, 1737, p. 80 (drawing.)

(*c*) Acta Eruditorum, 1709, p. 282.

(*d*) Machines Approuvées, tom. 2, p. 177, (drawing). The paddle-vanes are on hinges, and may be set to any angle.

(*e*) Gill's Technical Repository, vol. 4, 1829, p. 251.

(*f*) Machines Approuvées, tom. 2, p. 43.

" tides (if not excessive violent) out of or into any bays or harbours, " and also save ships from being stranded on a leeward shore, or " shipwrecked in stormes at sea, when, by stress of weather, ships " have lost their masts, sailes, or rudders; and will also force a " ship sixty miles a day in a perfect calm at sea, by which many " ships & men's lives will be preserved. That the said engine " will likewise enable a ship of smaller force to beat & take a " ship of the greatest force, by avoiding the enemy's side gunns, " and at the same time raking the enemy fore and aft with her " gunns at pleasure."

[No Specification enrolled.]

A.D. 1724, November 4.—N° 472.

BUMPSTED, Robert.—Machine for raising water.

" For Floating Ships out of Docks at any Tide."

" Draining and cleansing Rivers, Docks, or Ponds, & Lands overflown with Water."

[No Specification enrolled.]

A.D. 1725, February 11.—N° 475.

SMITH, Thomas.—" An engine to row ships ahead with Bars " against Wind & Tide, or stemming a Current, carrying Ships of " War in or out of Harbours, or Line-of-Battle Ship, useful for Fire-" Ships or Bomb Vessels, also to get up with or leave any Ship at " Sea when Wind is wanting; convenient in many cases, especially " when Ships have lost all their Masts & Jury Masts; for Packets " & Cruisers, & of great service in suppressing Pirates & Smugglers."

[No Specification enrolled.]

A.D. 1729, August 7.—N° 513.

ALLEN, John.—1. Relates to a method of treating liquors.

2. " For navigating a ship in a calm; my method will be " effected by forcing water or some other fluid through the stern " or hinder part of a ship, at a convenient distance under the " surface of the water, into the sea, by proper engines placed " within the ship. Amongst the several & peculiar engines I " have invented for this purpose is one of a very extraordinary " nature, whose operation is owing to the explosion of gunpowder. " I having found out a method of firing gunpowder *in clauso*, or " in a confined place, whereby I can apply the whole force of it, " which is inconceivably great, so as to communicate motion to a " great variety of engines; which may be also applied for draining " of mines and other purposes."

3. A method of drying malt.

[Specification printed by Commissioners of Patents, price 3d. No drawings. See Specimina Ichnographica, or a Brief Narrative of Several New Inventions, by John Allen, &c., London, 1730; Stuart's Anecdotes of Steam Engines, vol. 1, p. 195; Partington on the Steam Engine, p. 54; Hebert's Encyclopædia, London, 1836, vol. 2, p. 744 (where it is said Allen suggested the employment of a steam engine to work his machine). See also Rolls Chapel Reports, 6th Report, p. 118. Woodcroft on Steam Navigation, p. 10.]

In A.D. 1729, Du Quet described a contrivance by which a screw or helical feather, turned by the water in a stream, winds up a rope for towing vessels (*a*).

In A.D. 1729, Pitot explained the effect of Du Quet's (called Duguet's) screw, and gives a drawing, in which eight vanes at the ends of spokes are inclined at an angle of 54°. He recommends the screw to be wholly submerged, and it is stated that others proposed to set the floats of paddle-wheels at an angle, so that their surfaces if prolonged would be tangent planes to the paddle-shaft. Both the screw and paddle-wheels were meant to be worked by the current acting against them on a stationary raft, by which a rope is wound up (*b*).

In A.D. 1729, Boulogne described a boat drawing itself to a fixed anchor by paddle-wheels turned by the stream and winding up a rope (*c*).

In A.D. 1730, J. Allen suggested "the application of the fire-" engine" to work pistons for propelling a vessel, by forcing out air or water under the surface of the internal water. The drawing shows two pistons worked by beams and quadrants. He describes also a new boiler constructed so as to be used for this purpose on board ship. The fire rises through a diagonal pipe and goes out at the top through a chimney (*d*).

A.D. 1731, October 18.—N° 534.

[illegible], George.—" A machine that gives exactly the " way a ship makes, & counts her Leeway; that tells what speed " the Winds blow, & proves the different force of Current in any

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(*a*) [illegible] Approuvées, No. 338, p. 95 (where there is a [illegible] Screw Propeller, p. 8; Beaufort on the Archi[illegible] Collection, p. 22, where Du Quet's description [illegible] A.D. 1787; Tredgold on the Steam Engine, Appen-

(*b*) [illegible] de l'Académie Royale des Sciences, année 1729, Paris 1731, p. 81, [illegible] same volume), p. 385. The drawing is placed by

(*c*) [illegible] Tom. 4 pp. 308, 309.

(*d*) [illegible], or a brief narrative of several new Inventions [illegible] 7, 16, 56, 57.

" depth. And also a machine that will retard a Ship's driving " upon a Lee shore where there is no anchorage, or being forced " back in her Voyage by contrary Winds."

[No Specification enrolled.]

In A.D. 1732, the Comte de Saxe presented an account to the Academy of Sciences of a barge moved by paddle-wheels turned by horses (*a*); also of a barge moved by horses upon it winding up a rope.

In A.D. 1733, Maillard described an automaton swan moved by paddle-wheels, turned by clockwork; also a horse-like figure to draw a gondola, to be moved in a similar manner, but which was in fact propelled by paddles, turned by men (*b*).

In A.D. 1733, Limousin proposed to propel by a frame working common oars (*c*).

In A.D. 1734, Duvivier described a boat propelled by swinging paddles, moved back and forward by a lazy-tongs apparatus, worked by a pendulum oscillating fore and aft (*d*).

Hero of Alexandria (B.C. 150) describes methods for using the pressure of air expanded by heat (*e*), also the pressure of the atmosphere acting towards a partial vacuum caused by condensing air by cold (*f*), also a rotatory engine moved by steam which issues from the ends of arms revolving on an axis (*g*), also a boiler with tubes crossing a central cylindrical flue (*h*).

A.D. 1736, December 21.—N° 556.

HULLS, JONATHAN.—" A machine for carrying ships & vessels " out of or into any harbour & river against wind and Tyde, or in " a calm." The description of the invention given in the specification may be further explained by that furnished in a pamphlet published by the patentee, and referred to below.

Arms carrying paddle-floats are fixed on a horizontal axis suspended by framework behind the stern of a vessel, the axis lying

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(*a*) Machines Approuvées, tom. vi. p. 41 (drawing); Stuart's Anecdotes of Steam Engines, vol. 1, p. 198.

(*b*) Machines Approuvées, tom. vi. pp. 133, 137 (drawings).

(*c*) Recueil des Machines Approuvées, tom. vi. p. 103. (*d*) Ibid, p. 195.

(*e*) The Pneumatics of Hero of Alexandria, edited by B. Woodcroft, London, 1851, pp. 26, 57, 59, 83.

(*f*) Page 69.

(*g*) Pages 72, 95. The pressure of steam and heated gas in a closed cavern forces fluid up tube-like apertures in volcanoes and hot springs. If a joint of the petrifaction, " pentacrinite," is placed in vinegar it will move round by the action of gas formed and escaping at the ends of tubes around its circumference. Engines on this plan used in modern times, see " Craig's Rotary Engine," London, 1841, in Woodcroft's Collection of Pamphlets.

(*h*) Pages 100, 101.

across the direction of the vessel's length. On the axis are two wheels furnished with catches or palls, so that the axis may be caused to move in one direction only, while each of the wheels by which it is moved turns round alternately forward and backward. One of the wheels is turned by a rope *a*, worked by another wheel on an axis which is in the boat, and rotates back and forward by the action of the piston of a condensing engine, in conjunction with that of the weight to be mentioned.

The other wheel on the axis carrying the floats is turned by a rope *b*, drawn forwards by a falling weight. The wheels on the axis moved by the steam engine are so connected by ropes with the wheels on the other axis carrying the paddle-floats that the steam-engine, during the down stroke of the piston, turns this latter axis, and winds up the weight. While the piston is going in the other direction the weight draws round the axis on which the paddles are, still in the same direction as before, so that the paddle-floats rotate the same way by the power of the steam-engine and of the falling weight acting alternately, their action being regulated by the catches and palls, which render the two wheels alternately fixed or loose upon the axis, as is required.

The weight drawing the rope *b* must not be more than half the weight of the atmospheric column upon the upper side of the piston, estimated according to the degree of exhaustion produced by partially condensing the steam, because when the piston is acting by the vacuum beneath, it has to draw up the weight as well as to move the axis carrying the paddles.

In this pamphlet the patentee says: “ Up inland rivers, where “ the bottom can possible be reached, the fans may be taken out, & “ cranks placed at the hindmost axis to strike a shaft to the bottom “ of the river, which will drive the vessel forward with the greater “ force.”

[Printed, 3*d*. No drawings. See “A Description & Draught of a New Invented Machine for carrying Vessels or Ships out of or into any Harbour. “ Port, or River, against Wind or Tide, or in a Calm, for which His Majesty “ has granted Letters Patent for the sole Benefit of the Author for the “ Space of Fourteen Years.” By Jonathan Hulls. London. Printed for the Author, 1737. Price sixpence. (A manuscript copy is in the Great Seal Patent Office Library.) See also Repertory of Arts, vol. 12 (*third series*), p. 247; Mechanics' Magazine, vol. 1, p. 97; also vol. 27, p. 226; Register of Arts and Sciences, vol. 3, p. 347; also vol. 4, p. 309; Engineers' and Mechanics' Encyclopedia, vol. 2, p. 745; Thomson's Annals of Philosophy, vol. 13, p. 279; Stuart's Anecdotes of Steam Engines, vol. 1, p. 200; Woodcroft on Steam Navigation, p. 11; Fincham's History of Naval Architecture, p. 278; Partington on the Steam Engine, p. 184; Buchanan on Steam Propelling, p. 177; Tredgold on the Steam Engine, 2 vols., London, 1838, vol. 1, p. 14 (the drawing shews rope *g* in the wrong direction); London Encyclopedia (London, 1829), vol. 21, p. 126; Annuaire pour l'an 1837, Paris, 1836 p. 285; Rolls Chapel Reports, 6th Report, p. 155.]

In A.D. 1737, several machines for marine propulsion were described (*a*).

In A.D. 1738, D. Bernouilli proposed to propel a vessel by water flowing under pressure from orifices towards the stern (*b*).

In A.D. 1745, Masson described an apparatus for working an oar at the stern of a vessel, so as to give it a "sculling" motion, by causing its axis to describe a figure 8, and its broadside to press the water when moving one way, while the thin edge was turned in moving the other way. This was done by a crank and spur piece, or short lever, on the loom of the oar, guided by a helical fixed director (*c*).

In A.D. 1746, Bouguer mentions that "revolving arms like the vanes of a windmill" were tried for the propulsion of vessels" (*d*).

Two spirals working on a shaft in opposite directions are said, by Col. Beaufoy, to have constituted a mode brought from China (*e*).

In A.D. 1751, Grollier de Servier described vessels moved by paddle-wheels turned by cranks (*f*).

In A.D. 1752, Daniel Bernouilli described a method of propelling vessels by wheels with vanes set at "an angle of sixty "degrees both with the arbor and keel of the vessel, to which the "arbor is placed parallel. To sustain this arbor and the wheels, "two strong bars of iron, of between two and three inches thick, "proceed from the side of the vessel at right angles to it, about "two feet and a half below the surface of the water." The propellers for the stern he describes to be of similar construction, but shorter; and for driving them, he says they "can be moved by "men aboard the Vessels, or by Steam engines, or on Rivers by "horses placed in the Barges" (*g*). The machine here described

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(*a*) Acta Eruditorum, 1737, pp. 71, 120, 171, 227, 273 (being a summary from Machines Approuvées.)

(*b*) Bernouilli, Opus Academicum, 1738; Acta Eruditorum, 1739, p. 272; Tredgold on the Steam Engine, vol. 1, p. 298.

(*c*) Recueil des Machines Approuvées, tom. vii. p. 297 (where there is a drawing).

(*d*) "Traité du Navire," by Bouguer, Paris, 1746. See Bourne on the Screw Propeller, p. 8; Fincham's History of Naval Architecture, p. 279.

(*e*) Tredgold on the Steam Engine, vol. 1, p. 297. See note (*c*), *post*, p. 68.

(*f*) Recueil d'ouvrages curieux, &c., Paris, 1751, p. 94 (where there are drawings.)

(*g*) See Woodcroft on Steam Navigation, p. 13; Bourne on the Screw Propeller, p. 9; Fincham's History of Naval Architecture, p. 279. Historical notices of plans of Screw Propellers will be found in Mechanics' Magazine, vol. 39, p. 292. Daniel Bernouilli was born at Groningen. A memoir on Bouguer's and Bernouilli's suggestions for propulsion was presented by Kraft to the Royal Academy of St. Petersburg. See Novi Commentarii Acad. Scient. Imper. Petropolitanæ, &c., vol. 20, for A.D. 1775, quoted in the Monthly Review, London, 1777, vol. 56, p. 525.

seems to be similar to a screw propeller with several blades, and if the arbor is under water (as the bars to support it are stated to be), the propeller would be nearly submerged.

Bernouilli's plan is described, and several modifications proposed in Annales des Arts et Manufactures, tom. 20, p. 329 (A.D. 1803). These represent, by drawings, shafts annexed at the sides, bow, and stern of a vessel. Each shaft carries eight wheels, each wheel having eight spokes, with inclined broad vanes at the ends. It is suggested that a shaft might go out at the stern under water throuh a stuffing box, and means are described for raising the shaft (which is under water). The steam engine is proposed to be used to turn the shaft by having a T cross head on the piston-rod, working vertically with a crank or connecting-rod at each end, turning wheels, one of which works the shaft.

In A.D. 1753, Euler proposed to use a shaft with four floats at right angles. This was worked by a vertical shaft with a toothed wheel and pinion (*a*).

In the same year, " Mathon de la Cour proposed the use of six
" floats on each axle, & the intervention of an endless cord passing
" over a drum at the end of the axle, which was fastened to the
" side of the ship, & over a corresponding drum annexed to the
" frame " (*b*).

In A.D. 1755, Gautier proposed several modes for applying the steam engine to give rotatory motion for propulsion (*c*).

In A.D. 1760, J. A. Genevois described a method of using steam engines or gunpowder to bend springs which were to move the oars for propelling vessels (*d*). The same writer proposes to employ oars formed with double hinged vanes opening like the leaves of a book, and partially folding together during the return stroke, like the foot of a duck; also broad propellers with vanes hung on spindles, in the manner of louvre boards, which lie flat together when acting on the water, and open to a certain extent during the return stroke. He suggests also the distillation of fresh water from sea water for use on board ship (*e*).

(*a*) Fincham's History of Naval Architecture, p. 280, where there is a drawing.

(*b*) Ibid., p. 280, (drawing.)

(*c*) Ibid., p. 281.

(*d*) Woodcroft on Steam Navigation, p. 13; Fraser's Magazine, vol. 38, No. 225, p. 370.

(*e*) See a manuscript copy, in the Great Seal Patent Office Library, of the memoir, entitled "Some New Inquiries tending to the Improvement of Navi-"gation, by J. A. Genevois, Minister in the Canton of Berne. London, 1760."

A.D. 1766, December 17.—N° 866.

LEVY, ISAAC.—" Floating Machine for conveying Timber & other " materials, such as Staves, Boards, Plank, Iron, and Masts, from " one part of the world to another without Shipping." This invention consists in intersecting and bolting together large pieces of timber in the form of a ship, so as to leave no vacuity. Such structures are to be rigged like sailing vessels, to have rooms fixed in them for mariners, and to be ballasted with iron or iron ore.

[Printed, 3*d*. No drawings. See Rolls Chapel Reports, 6th Report, p. 159.]

A.D. 1767, November 11.—N° 884.

BISSY, STEPHEN BARON DE.—" An oar quite new." A broad vane is divided into leaves suspended to a frame, so that when moved one way through the water the leaves close, and when moved the other way they open for the return stroke.

[Printed, 3*d*. No drawings.]

In A.D. 1768, Paucton proposed that " a ptérophore, composed " of the circumvolution of the thread of a screw round a cylinder, " should be placed at each side of a vessel, or only at the fore " part." These propellers might be wholly or partially immersed (*a*).

A.D. 1769, January 5.—N° 913.

WATT, JAMES.—" New invented method of lessening the con- " sumption of steam and fuel in fire-engines."

1. The cylinder must be " kept as hot as the steam that enters it."
2. " The steam is to be condensed in vessells distinct from the " steam vessells or cylinders."
3. The air is drawn from the condenser by an air pump.
4. " I intend in many cases to employ the expansive force of " steam to press on the pistons, or whatever may be used instead " of them, in the same manner as the pressure of the atmosphere " is now employed in common fire engines. In cases where cold " water cannot be had in plenty, the engines may be wrought by " this force of steam only, by discharging the steam into the open " air after it has done its office."

(*a*) Bourne on the Screw Propeller, p. 10; Tredgold's Appendix D., p. 3. Brevets, tom. 18. p. 244 (note), where he is noticed as the inventor of the screw propeller.

5. A rotary engine with weights and valves in circular channels.
6. Lubrication of the piston by oil, rosin or quicksilver.

[Printed 5*d*. No Drawings. See Repertory of Arts, vol. 1, p. 217. Mechanics' Magazine, vol. 1, p. 4. Ross on Steam Navigation, p. 22. Farey on the Steam Engine, p. 316. Register of Arts and Sciences, vol. 4, pp. 24 & 346. Engineers' and Mechanics' Encyclopedia, vol. 2, p. 725. Webster's Reports, vol. 1, p. 56 (note); also pp. 230—282—285. Webster's Patent Law, p. 46, also p. 127. Cases 30, 31, and 32. Blackstone's Reports, vol. 2, p. 463. Carpmael's Reports on Patent Cases, vol. 1, pp. 117—156. Davies on Patents, pp. 155—162—221. Parliamentary Report, 1829, (Patent Law,) pp. 187—189—190. Vesey's (junr.) Reports, vol. 3, p. 140. Term Reports by Durnford and East, vol. 8, p. 95. Woodcroft on Steam Navigation, p. 14. MacGregor on the Language of Specifications, London, 1856, p. 61 (note), and p. 82 (note.) Partington on the Steam Engine, p. 185. Buchanan on Steam Propelling, p. 18, *et seq*. Rolls Chapel Reports, 6th Report, p. 160.]

A.D. 1769, March 14.—N° 921.

MOORE, Francis.—" Machines or engines made of Wood, Brass, " Iron, Copper, and other Metal, to be wrought or put in motion by " Fire, Water, or Air with a small assistance of Horses or manual " labour, which will be very useful in Agriculture, Carriage of " Persons, Goods, & Navigation, by causing Ships, Boats, Barges, " & other Vessels to proceed with more swiftness."

[No Specification enrolled.]

A.D. 1769, July 13.—N° 933.

MOORE, Francis.—Machines " capable of being wrought or " put in motion by Force or power, without being drawn by Horses " or any other Beasts or Cattle, & will be very useful in Agriculture, " Carriage of persons & Goods, & also in navigation by causing " Ships, Boats, Barges, & other Vessels to move, sail, or proceed " with more swiftness or dispatch than usual."

[No Specification enrolled. See Mechanics' Magazine, vol. 16, p. 135. Woodcroft on Steam Navigation, p. 123.]

In A.D. 1770, James Watt mentions a screw propeller turned by a steam engine (*a*).

In A.D. 1772, a description was published of experiments with a submarine vessel by Dionis, of Bordeaux, which carried ten persons under water for four hours and a half (*b*).

In A.D. 1774, the Comte d' Auxiron tried experiments on the Seine, which were followed up by Perrier, who used a steam engine

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(*a*) Letter to Dr. Small (who replies he had tried it), with a drawing; Muirhead's James Watt, London, 1854, 3 vols., vol. 2. pp. 4, 8, 11.

(*b*) Journal Encyclopédique, Août 1, 1772, referred to in Dictionnaire des Inventions (Bruxelles, 1838), p. 65.

(of about one horse power), to move two wheels, one on each side of a vessel (*a*).

A.D. 1775, November 22.—N° 1108.

MILLER, Samuel.—1. A windmill fixed on a vessel's deck turns in a direction across the length of the vessel. (The drawing seems to show this, although imperfectly.) An endless rope band on the shaft of the windmill works below deck another horizontal shaft, on which is a toothed wheel *h*.

Two toothed wheels, free to move up and down on a vertical shaft, are caused to gear alternately (by snails or 'clicks') into the wheel *h*, the continuous motion of which thereby works the vertical shaft round in opposite directions alternately upon the shaft. A horizontal cog-wheel gearing into a racked segment at the end of a bar causes it to oscillate in a vertical plane across the vessel. The arm of this segment moves an endless rope across the vessel, round two rollers, and to this rope are connected the inner ends of two oars projecting from the vessel's stern. The outer ends of the oars are thus caused to vibrate in the water in directions across that of the vessel's length.

2. The windmill already mentioned has at the end of each vane projecting in the line of the arm "a flat piece of iron inclined forty "five degrees which cuts through the water." The positions of the several parts as represented in the Drawing are not consistent with a motion of the windmill either across the vessel's length or along that direction. If the windmill moves in the latter way, each of the iron pieces at the end of the vanes will strike the water like the float of a paddle-wheel fixed obliquely. If the mill revolves across the vessel each of the iron pieces will strike the water in a manner resembling that of working a four-bladed screw propeller of which the axle and the greater part of the blades are out of the water.

3. A chain pump and a reciprocating pump are worked by ropes and wheels or cranks from the shaft of the windmill.

[Printed, 9*d*. Drawings.]

(*a*) Stuart's Anecdotes of Steam Engines, vol. 1, p. 282; Scott Russell on Steam Navigation, p. 238; Woodcroft on Steam Navigation, p. 14. It is said to have been in A.D. 1775, in Essais sur les Machines Hydrauliques, par Ducrest, Paris, 1777, p. 184; Historical Notice of Steam-boats, by Arago, in "Annuaire pour l'An 1837," p. 291; "Des Bateaux à Vapeur," par Jouffroy, p. 1; Stuart's Anecdotes of Steam Engines, vol. 1, p. 284.

A.D. 1776, March 11.—N° 1117.

BERFORD, Michael Laurenco.—A windlass has several sets of eyes in rows along its surface.

Several bars placed parallel to the windlass are connected by ropes, so that a number of men acting on each bar will advance and draw forcibly back the bar nearest the windlass, which bar has hooks taking into the eyes. When the windlass is thus pulled partly round the hooks are disengaged, and the bar furnished with them is moved forward to lay hold of another row of eyes.

The windlass is adapted for various purposes, among others, for "rowing and craining."

[Printed, 6*d.* Drawings.]

A.D. 1776, March 12.—N° 1118.

BARBER, John.—1. A boiler of a dome shape, with a bottom convex inwards. Below it is the furnace, from which the fire circulates round and above the boiler. An inner case in the boiler reaches below the level of the water on the bottom, and thus a layer of water between this case and the sides of the boiler is exposed to the upper and side flues. Feed pipes and gauge cocks are shewn.

2. Steam from the boiler impinges from a jet on small vanes set in a grooved horizontal wheel turning above them, and giving motion by toothed wheels, to a vertical wheel which (as the steam jet is turned one way and the other alternately) winds and unwinds two ropes, to raise and lower baskets in a mine. On the axle of this wheel are three cranks, working three beams connected with pumps.

3. "The motion is also applicable to grinding of corn, bark, "flint, clay, or any other matter, & may also be applied to wheel "carriages, or to rowing any ship or vessel in a calm or against "the wind, and is, indeed, applicable to every sublunary motion."

[Printed, 9*d.* Drawings.]

In A.D. 1776, Guyon de la Plombiere suggested the use of a steam engine for propelling a vessel (*a*).

In A.D. 1776, D. Bushnell, an American, gave an account of a submarine vessel :—" An oar, formed upon the principle of the

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(*a*) Encyclopédie Moderne, Paris, 1855, Art. "Vapeur," p. 171.

" screw was fixed in the fore part of the vessel; its axis entered " the vessel, & being turned one way, rowed the vessel forward, " but being turned the other way, rowed it backward; it was " made to be turned by the hand or foot" (*a*).

In A.D. 1776, the Marquis de Jouffroy used a steamboat on the Doubs, with propellers which opened and closed like louvre boards (*b*).

In A.D. 1778, a Jesuit missionary writing from Pekin in China, describes a paddle-wheel boat which may have been used very long before. He calls it " Barque à Roues." It was 42 feet long and 13 wide, with two paddlewheels on each side, the spokes of which dipped one foot in the water. The paddles were turned by men protected (for war) by closed bulwarks carved with tigers' heads. The writer approves of the construction and recommends it (*c*).

A.D. 1779, March 10.—N° 1213.

WASBROUGH, MATTHEW.—" New invented machine or piece " of mechanism, which, when applied to a steam engine or any " reciprocal movement, produces a circular or rotative motion " without the medium of a water wheel."

" To any steam engine or other machine that hath a reciprocal " or alternate movement, I apply one or more pullies, wheels, or " segments of wheels, to which are fastened rochets & clicks or " palls so contrived that while the engine or machine moves in " a perpendicular, horizontal, or diagonal direction, that the rotative motion shall be effected."

" By moving or shifting a wheel & its axis from one set of " teeth or cogs" a like effect is produced.

" I also, for some purposes, apply racks with teeth, & sometimes " the teeth I make to tumble or move on their own axis or center."

" For some purposes, instead of applying a working beam or " great lever, I substitute a wheel or pulley, working by racks or " chains from the piston in the engine cylinder."

(*a*) See a copy of the description at length in manuscript, at the Great Seal Patent Office library; also, Repertory of Arts, vol. 15, p. 385 *et seq.* Woodcroft on Steam Navigation, p. 14. Bourne on the Screw Propeller, p. 10; where also Fulton's use of a propeller like the sails of a windmill is mentioned.

(*b*) See " Des Bateaux à Vapeur," par Jouffroy, p. 13. (The writer was the son of the Marquis.) The boat was 40 feet long and 6 feet wide, and the propellers were moved by a chain from a single cylinder and counterpoise. L'Univers Dictionnaire Encylopedique de la France. Paris, 1845, vol. 9, p. 737.

(*c*) Mémoires des Chinois, &c., vol. 8, p. 343. There is a drawing, pl. 22, fig. 94. Scott Russell on Steam and Steam Navigation, p. 182.

" Likewise, in some cases, I add a fly or flies, in order to render " the motion more regular and uniform."

He describes several purposes for which the engine may be used, and adds:

" Lastly, I intend to apply my engine as described above, for " the purpose of moving ships, boats, or lighters, or any vessel in " water."

[Printed, 3*d*. No drawings. See Rolls Chapel Reports, 6th Report, p. 141; also, Stuart's Anecdotes of Steam Engines, vol. 2, p. 329. Woodcroft on Steam Navigation, p. 16. Partington on the Steam Engine, p. 187. Farey on the Steam Engine, p. 409.]

A.D. 1780, May 4.—N° 1255.

BACHE, WILLIAM.—Raising water in tubes, and discharging it forcibly on wheels or other instruments, so as thereby to obtain motive power.

[Printed, 3*d*. No drawings. See Repertory of Arts, vol. 6, p. 163.]

A.D. 1780, August 23.—N° 1263.

PICKARD, JAMES.—" New invented method of applying Steam " Engines (commonly called Fire Engines) to the Turning of " Wheels, whereby a Rotative Motion (or Motion round an Axis " is performed), and the Power of the Engine is more immediately " and fully applied, where Motion round an Axis is required, than " by the intervention of Water Wheel."

This invention is that of the crank by which the reciprocating motion of a beam acting on a connecting rod turns a wheel.

[Printed, 5*d*. Drawings. See Woodcroft on Steam Navigation, p. 17. Farey on the Steam Engine, p. 409.]

In A.D. 1780, Jouffroy used as an engine for his boat with the duck-foot propeller, two cylinders, inclined at an angle, and turned by a barrel with a chain (*a*).

A.D. 1781, October 25.—N° 1306.

WATT, JAMES.—Various methods of obtaining rotatory or circular motion from reciprocating motion.

1. A friction wheel is moved by the connecting rod from the beam end "against the lateral surface of a wheel fixed obliquely " upon the primary axis, shaft, or wheel which is to receive the " rotative motion."

(*a*) L'Univers Dictionnaire, &c., vol. 9, p. 737.

2. A friction wheel acts upon an excentric wheel in conjunction with a weight.

3. The connecting rod works upon a pin in the periphery of the wheel on the shaft, and turns the shaft (by the ordinary operation like that of a crank) in conjunction with a weight.

4. Two engine-beams act upon the same shaft in conjunction with a weight.

5. A cog-wheel on the connecting rod turns one on the shaft by the "sun and planet motion," the former wheel being outside or inside of the latter.

[Printed, 10*d.* Drawings. See Register of Arts and Sciences, vol. 4, p. 56 and p. 92.; Engineers' and Mechanics' Encyclopedia, vol. 2, p. 745; Stuart's History of the Steam Engine, p. 136; Woodcroft on Steam Navigation, p. 17; Tredgold on the Steam Engine, vol. 1, p. 27; Rolls Chapel Reports, 6th Report, p. 166.]

In A.D. 1781, Jouffroy used a steam-boat at Lyons, with paddle-wheels on a shaft turned by chains fixed to pistons in two cylinders, inclined in opposite directions at an angle of 30° to the horizon (*a*).

At the Great Seal Patent Office library is a copy (by R. Prosser, A.D. 1830) of a French print, by Jamont, engraver for the Journal des Maires (date A.D. 1816, Journal des Maires, No. 35), entitled "Plan et Profil du Bateau à Vapeur exécuté par M. le Marquis de Jouffroy à Lyon, en 1783." It represents a steam-boat 140 feet long, with paddle-wheels on a shaft turned by a single horizontal steam cylinder and a piston with double rack work and pauls on the piston rod. This rack work, called "La Crémaillère," appears to be that described by D. Papin in A.D. 1690 (see notice *ante*). From an extract in the Great Seal Patent Office library, taken from the Journal des Maires, May 16, A.D. 1816, No. 35 (and of which only one copy could be found in Paris, in the possession of the editor of the paper), it appears that no reference is made

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(*a*) See "Des Bateaux à Vapeur, par Jouffroy," p. 17. The dimensions of this vessel are given differently. Jouffroy says it was 140 feet long (p. 17), and in the official trial, 130 feet long (pp. 57, 66.) The Journal des Dèbats (quoted p. 62) says 140 feet long. Tredgold (quoted p. 94) says 143 feet long. Dictionnaire des Inventions, by Marquis de Jouffroy, 1852, says "41 metres," Mignés' N. Encycl., vol. 36, Art. Velopedes, p. 1339. Arago, in his note, says Jouffroy made his vessel in A.D. 1781 (Annuaire pour l'An 1837, pp. 291–293). Jouffroy says the plan was "réalisé à Lyon" in 1780 (p. 102), used in 1781 (pp. 17,), "construit à Lyon" in 1782 (pp. 23, 25), "exécuté a Lyon en 1783" (Brevets, vol. 21, p. 230.) An official report says the vessel sailed in A.D. 1780, Des Bateaux, p. xx. The official trial was in A.D. 1783 (pp. 57, 66). Arago assigns the date A.D. 1791 to Miller's invention (instead of 1787), and A.D. 1801 to Symington's (instead of 1787).

to any original or prior drawing from which that given in the Journal des Maires is taken (*a*).

In A.D. 1782, Desblancs sent a model to the Conservatoire des Arts et Métiers of a steam-boat moved by a chain of floats carried on wheels at its side turned by a horizontal cylinder (*b*).

In A.D. 1783, J. Fitch moved a boat "by paddles," worked by a steam engine on the Delaware river (*c*).

A.D. 1784, April 10.—N° 1426.

KEMPELEN, Wolfgang de.—"Reaction machine." Steam from a boiler enters a horizontal tube supported in the middle on an axis on which it revolves, when the steam is allowed to escape by two apertures near the closed ends of the tube at opposite sides.

[Printed, 6*d*. Drawings. See Rolls Chapel Reports, 6th Report, p. 168.]

A.D. 1784, August 20.—N° 1447.

WOOD, Sutton Thomas.—"My sixth improvement is the ap-"plication of steam or fire engines to all Ships, Lighters, Barges, "Boats, or vessels, to answer every purpose of rowing, pushing,

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(*a*) A drawing similar to that in the Journal des Maires (described as representing the engine used in A.D. 1783) is given with a patent granted to Jouffroy in A.D. 1816; Brevets d'Invention, tom. 21, p. 230, p. 33, fig. 1. A copy of the drawing is given in Encyclopédie Moderne, Paris, 1855; Atlas, vol. 3, pl. 69. These three represent the engine of A.D. 1783 as a single horizontal cylinder with rack work. The engine is described as double by M. Arago, "Le bateau essayé à Lyon renfermait deux machines à vapeur distinctes," Annuaire 1837, and by Jouffroy, in Des Bateaux à Vapeur, pp. 2, 18, while the rack work of a single engine seems to be referred to at p. 93. The Report by MM. Arago, C. Dupin, Poncelet, and Ségnier, describes the engine used for the duck-feet propeller, as double, Comptes Rendus, Paris, 1840, p. 675. An article on "Jouffroy," by Parisot, does the same in Biographie Universelle, Supplement, Paris, 1811, vol. 68. There appears then to be a confusion between Jouffroy's engine of A.D. 1776 with a single cylinder (note (*b*) p. 31, *ante*); his engine of A.D. 1780 (see note (*a*) p. 32, *ante*,) with two cylinders; that patented in A.D. 1816, which had a single engine and rack work, Des Bateaux, p. 93; and that described in the Official Report, p. xvii., which was double. In Jouffroy's pamphlet, no drawing of the engine of A.D. 1783 is given, although two others are inserted. The Registry of the Academy of Science (20 December A.D. 1783) has an entry to the effect that MM. Borda and Perrier, gave an account of Jouffroy's steam engine, ending "Attendre les experiences," Encyclopédie Moderne, p. 171; Jouffroy, p. 59. What this engine was is not mentioned. Tredgold says, "The idea of employing the steam engine to propel vessels which had been suggested by Hulls, was first tried in practice by the Marquis de Jouffroy," Steam Engine, vol 1, p. 31, London Encyclopedia, vol. 21, p. 126. A French work says, "M. de Jouffroi pretendit dans une espece de *factum*, publié en 1815, sous le titre des 'Bateaux à Vapeur," que cet Americain (Fulton) avait derobé le merite de son invention et n'avait fait que reproduire le bateau à vapeur construit à Lyon. L'accusation en termes trop peu modérés n'etait pas juste,"&c. Biographie Nouvelle des Contemporains, Paris, 1823, vol. 9, art. "Jouffroi." In A.D. 1818, Desblancs' invention (see next note) is referred to in the French official documents, as the first application of steam to marine propulsion, Brevets d'Invention, vol. 2, p. 105, where the invention seems wrongly described. In A.D. 1802, he took a patent, Brevets, vol. 22, p. 329; but see Bourne, p. 12.

(*b*) Des Bateaux à Vapeur, par Jouffroy, p. 26; Stuart's Anecdotes of Steam Engines, vol. 2, pp. 450, 483.

(*c*) Stuart's Anecdotes of Steam Engines, vol. 2, p. 386; se p. 36, *post*.

" punting, towing, hauling, or navigating the same, without the " labour of man or horses, or the assistance of wind, current, or " tide; and my method is as follows:—To the end, or to any part " of my working beam, I attach or suspend my connecting rod, " to which I apply a rotative motion, either one of my own " herein-after described, or a crank, or any other rotative motion. Or " I apply a rotative motion to the piston rod itself, by which motion " the wheel and axis is made to revolve, which in its revolutions " carry with it vanes, levers, or paddles that are fixed to the extremity " of the axis or a wheel or wheels similar and like unto a ground shot " wheel." The wheel has spokes, "to the end of which I place or " apply vanes or paddles, such as *n*, or I make them in any other " shape or form, but I do apply them as to cause them to act in " such a manner that in their descent they shall strike or press " against the water with sufficient power, whilst in their ascent they " act or press out of the water, inclined or edgeways, as I have " endeavoured to represent them in Fig. 16." The figure does not represent the vanes or paddles as moveable on the wheel.

[Printed, 1*s*. 3*d*. Drawings. Rolls Chapel Reports, 6th Report, p. 169.]

A.D. 1785, May 9.—N° 1478.

BRAMAH, Joseph.—1. A rotary steam engine, in which an axis carrying a revolving leaf, slider, or piston is turned by steam or fluid. A partition or stop piece opens and shuts as the piston passes.

2. The steam used in an engine is condensed and returned to the boiler, so that spirits may thus be employed instead of water.

3. A similar plan to that described first, modified so as to act to and fro round a part of the circle as a reciprocating engine.

4. A paddle-wheel A, fixed directly behind the stern.

5. "Instead of the wheel A, may be introduced a wheel with " inclined fans or wings, similar to the fly of a smoke-jack or the " vertical sails of a windmill. This wheel or fly may be fixed on " the spindle C alone, and may be wholly under water, when it " would, by being turned round either way, cause the ship to be " forced backward or forward, as the inclination of the fans or " wings will act as oars with equal force both ways and their power " will be in proportion to the size & velocity of the wheel, allowing " the fan to have a proper inclination."

6. An equilibrium valve.

[Printed, 1*s*. 6*d*. Drawings. See Repertory of Arts, vol. 13 (enlarged *series*), p. 239; Woodcroft on Steam Navigation, p. 17; Bourne on th Screw *Propeller*, p. 10; Rolls Chapel Reports, 6th Report, p. 171

In A.D. 1786, J. Fitch, in America, proposed to use vertical oars worked by cranks turned by a horizontal steam engine (*a*).

In A.D. 1786, O. Evans, in America, proposed to propel steam-boats by paddle-wheels (*b*).

A.D. 1787, June 5—N° 1610.

SYMINGTON, William.—1. Relates to heating the cylinder of a steam engine. 2. Loading the piston. 3. Placing a flue round the cylinder. 4. A boiler.

"Fifthly, when rotatary motions, of whatever kind, are wanted, " two ratchet wheels, such as are marked *i*, *i*, in Section No. 3, will " be placed upon two or the same axis, in such manner that while " the engine turns forward the one wheel, the other will be reversed " without impeding the motion or diminishing the power, so as " to be ready to carry on the motion by the time the other wheel " begins to be reversed."

In A.D. 1787, Patrick Miller, of Dalswinton in Scotland, published a pamphlet on the subject of propelling boats by means of paddle-wheels turned by men, in which he gives a detailed account of several experiments which he had made with them (*c*).

[Printed, 10½*d*. Drawings. See Mechanics' Magazine, vol. 19, p. 354; Woodcroft on Steam Navigation, p. 19.]

In A.D. 1787, Serrati described a small steam-boat (*d*).

A.D. 1788, March 4.—N° 1640.

FOURNESS, Robert, and ASHWORTH, James.—Steam from a boiler passes to a regulator, from which a valve with three

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(*a*) Woodcroft on Steam Navigation, p. 47 (drawing); p. 44, note (*a*), *post*.

(*b*) Gill's Technical Repository, 1829, vol. 4, p. 251 (for 1823), where a paper by Evans is given, but no further authority.

(*c*) See Woodcroft on Steam Navigation, p. 20, *et seq.*, where a copy of the pamphlet will be found, as well as copies of the drawings referred to in it. For information on the inventions of Patrick Miller, William Symington, James Taylor, Henry Bell, Robert Fulton, John Fitch, Oliver Evans, Marquis de Jouffroy, and others contemporary with them, see Mechanics' Magazine, vol. 18, p. 162; vol. 19, p. 158 and p. 354; vol. 28, p. 34; Woodcroft on Steam Navigation, p. 18 to p. 86; Stuart's Anecdotes of Steam Engines, vol. 2, p. 385 *et seq.*; Scott Russell on Steam and Steam Navigation, p. 180 *et seq.*; Fincham's History of Naval Architecture, p. 281 *et seq.*; Bourne on the Screw Propeller, p. 10; Quarterly Review, No. 38; Partington on the Steam Engine, p. 50; Des Bateaux à Vapeur, par Jouffroy, p. 1; Galloway on the Steam Engine, London, 1829, p. 300; Tredgold on the Steam Engine, vol. 1, pp. 31, 44; vol. 2, Appendix, p. 101; Memorials of James Watt, 1856, p. 217; Frazer's Magazine, vol. 38, No. 225, p. 276; Thomson's Annals of Philosophy, vol. 13, p. 279; Engineers' and Mechanics' Encyclopedia, vol. 2, p. 745; Quarterly Review, for 1818, vol. 19, p. 347; Arago's Mémoire in Annuaire pour l'An 1837, Paris, 1836, p. 285; Quarterly Journal of Science and Art, vol. 5 (*new series*), 1829, p. 322; London Encyclopedia, vol. 21, p. 126; Bell's Letter to the Editor of the Caledonian Mercury in Woodcroft's MS. collection.

(*d*) Lettere di Fisica Sperimentale di D. Serafino Serrati. Firenze, 1787. 12mo. Quoted in Biographie Universelle. Paris, 1856, vol. 15. Art. "Fulton," (note), see p. 47, *p* segmental ports opened in rotation admits the steam to three cylinders successively. Injection water is supplied by a similar valve. Each cylinder has its piston connected by rods and chains to one bend of a three-throw crank on a shaft working toothed wheels, which move paddle-wheels on separate bearings. The bearings of the paddle-wheels may be raised or depressed (their toothwheels being still in gear with those of the crank shaft) by the action of a pinion on a semicircular rack.

[Printed, 6*d*. Drawings.]

In October, A.D. 1788, Patrick Miller's "double pleasure boat" was propelled by a steam engine turning two paddle-wheels, one before the other, in the space between the hulls. The steam engine of this boat used by Miller, Taylor, and Symington, will be found in Mr. Woodcroft's Collection of Curiosities at the Great Seal Patent Office (*a*). It is of about one-horse power, with two upright cylinders working the shafts by chains, arranged according to Wasbrough's patent, No. 1213 (*ante*). The following notice is given of it in the descriptive catalogue of the Museum of Patented Inventions at South Kensington, where the engine was exhibited in June 1857:—

" This little machine has the following claims to be considered the " parent engine of steam navigation. Prior to the year 1788, when " it was applied to propel a boat, as already mentioned, numerous " projects had been proposed, and a few abortive attempts had been " made to propel vessels by steam power, commencing with an " experiment in the year 1543, but the whole of the projects and " experiments made previous to the application of this engine " proved valueless for any practical use.

"The result of the experiments with this engine, and with a " larger one subsequently made on the same plan, demonstrated to " Symington that a more simple arrangement of the parts forming a " steam engine was required before steam power could be applied " practically to navigation.

" In 1801 Symington was employed by Lord Dundas to construct " a steam boat, and having by his former failures learned what was

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(*a*) Woodcroft on Steam Navigation, p. 36 (where there is a drawing). A history of this engine is given in Mechanics' Magazine, vol. 66, No. 1,764 (May 30, 1857). "Steam navigation was the joint invention of these three, P. Miller, " J. Taylor, and W. Symington."—Scott Russell on Steam and Steam Navigation, p. 181. Fulton, from America, was in England in A.D. 1786, and wrote to P. Miller about his vessels, *ibid.*, p. 201. He was on board Symington's steamboat in July, A.D. 1801. Woodcroft on Steam Navigation, p. 64.

" required, he availed himself of the great improvements recently " made in the steam engine by Watt and others, and constructed an " improved engine in combination with a boat and paddle-wheel, " on the plan which is now generally adopted. This boat, called " the 'Charlotte Dundas,' was the first practical steam-boat; and " for the novel combination of all the parts Symington obtained " Letters Patent on the 14th October 1801, N° 2544."

A.D. 1788, November 6.—N° 1673.

RUMSEY, JAMES (*a*).—1. " Certain new methods of constructing " boilers for distillation and other objects, & for steam engines " for various purposes." These include partitions in the boiler, projections, and tubes, previous heating by the smoke before the fluid is boiled, evaporating one fluid by passing it through another, communicating motion to cylinders connected with boilers, exhausting the air from vessels holding the fluid to be evaporated, interposing an air vessel between the forcing power and the tube which conveys away the water raised so as to give equable motion to it.

2. A spiral tube is wound on a drum or wheel moving on horizontal hollow axles. Valves in the tube allow a body to move in it only in one direction. "A proper quantity of fluid, or any " substance in a fluid state being put into this tube, and the steam " being admitted between the fluid and the valves, forces the fluid " in the tube up one side of the wheel, the weight of which and the " reaction of the steam on the valves successively keep the wheel in " motion."

3. A box with a valve opening one way only is drawn by chains back and forward along the keel of a vessel, or in a trunk in its bottom open to the water. The chains are connected with wheelwork in the vessel, which is moved by a frame with ratchet wheels and palls, so that the reciprocating motion of the steam engine moves the wheels for a certain time in each direction.

4. Water drawn into a tube along a vessel's keel is discharged at one or other of the extremities by the action of a force pump. The water may be admitted at various openings along the tube, and in certain cases air is also to be admitted.

(*a*) He was an American. A vessel made according to the plan described in this Patent was used on the Potomac in America in A.D. 1787, (Stuart, vol. 2, p. 387,) and on the Thames, A.D. 1793. Stuart's Anecdotes of Steam Engines, vol. 2, p. 411 Hebert's Encyclopedia, vol. 2, p. 745.

5. The box moving along the keel as already described may carry poles on swivels, which will push against the ground to propel the vessel.

6. Rotatory motion is given to a vertical axis by causing a stud on a vertical piston rod to act alternately upon two spiral "felloes" wound in opposite directions round a drum attached to the axis.

[Printed, 11*d*. Drawings. See Woodcroft on Steam Navigation, pp. 48, 51. Rolls Chapel Reports, 6th Report, p. 179. The Patent is referred to in Specification Nº 1738, *post*.]

A.D. 1789, December 12.—Nº 1718.

DELOLME, John Lewis.—1. A weighted frame to act instead of ballast, hangs beneath a vessel by hinges from its sides, and it may be raised by ropes, so as to lie nearly flat along the bottom.

2. When the weighted frame is open fore and aft, room is given for a cutwater hinged to the keel, and which may be hauled partly to one side as the vessel heels over, or folded up close to her bottom in shallow water. The stem of a vessel is made vertical or inclining backwards.

3. The rudder protrudes below the keel, and may be raised along a rod. It may also be fixed at any angle by a catch and ring round the outside of the rudder. The rudder may be worked by a pinion and wheel on the rudder-head, and its position may be indicated by a pointer moved by wheels.

4. A square sail is divided longitudinally down the centre, and it may be furled on the lower yard by turning round the yard, which is slung in rings fixed to a hoop embracing the mast.

[Printed, 11*d*. Drawings.]

A.D. 1790, March 13.—Nº 1732.

STANHOPE, Charles Earl. — 1. A method of constructing a vessel called an "Ambi-navigator," with both ends alike, and with certain forms and proportions.

2. A rudder turns on an axis passing through its surface, so that it is like a vane with one part of the surface forward and the other aft of the axis, and is thereby more easily turned and held against the water. It is called an " Equipollent Rudder."

3. A vessel is propelled by a swinging bar vibrating fore and aft in a well cut through the hull. At the end of the bar is a vane

attached to it by a joint working on a short arm fixed in the centre of the vane. When the bar and vane move one way, the vane turns to a horizontal position, and offers little resistance, but when they move the other way the vane turns to a position nearly vertical, and is retained in that position by a shoulder on the joint.

[Printed, 1*s*. 6*d*. Drawings. See Rolls Chapel Reports, 6th Report, p. 182.]

In December, A.D. 1789, a second steam-boat was used on the Forth and Clyde canal. This was of 12-horse power, and similar in construction to that already made by the same three persons, Miller, Taylor, and Symington (*a*).

A.D. 1790, March 24.—N° 1738.

RUMSEY, James,—1. " Giving powerful motion to vessels, machines, and engines by means of the re-action occasioned by " projecting, discharging, or forcing of water or other matter from " them by the power of steam or other agents, applied so as to " exert their force between the vessel or machine to be moved, and " a column of water or some other body that is independent of " such vessel or machine (as powder exerts itself between a cannon " and the independent ball), by which means the vessel or machine " will be impelled with a force proportionate to the power of the " steam (or agent employed instead thereof), and the vis inertiæ of " the water or other matter opposed thereto." The " progressive " and retrograde watermill consists of cylinders, either moveable, " or pistons that are stationary or within each other, or that have " pistons moveable within them from one end to the other, with " but little friction." The piston is moved by water from a head above, admitted by valves in a manner similar to that by which steam acts in the cylinder of a high-pressure steam engine.

2. " My improvement of Dr. Barker's mill consists in causing " the water that works the machine to descend through a fixed " tube (or whatever may be used instead thereof), and in general " to enter the revolving tube at bottom."

3. Water admitted to a vibrating tube causes its alternate motion by the opening of valves to discharge the water on each side in the plane of its vibration alternately.

4. Giving motion " by causing water, steam, or air to act either " mediately or immediately, separately or together, above, beneath,

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(*a*) Scott Russell on Steam and Steam Navigation, p. 194.

" or against the weight, *vis inertiæ*, or resistance of water or other " matter intended to be raised or moved in any direction whatever, " or against pistons moving in cylinders, tubes, or trunks."

"The invented steam and forcing engine consists of stationary " cylinders of different (or the same) bores, as circumstances may " require, which are screwed or otherwise joined together, end to " end, without any partition between them. In these cylinders " moves a cylindric piston, one end of which fills & moves in one of " the cylinders, the other end does the same in the other. In this " moveable cylindric piston (which is as large as one of the cylinders) " is fixed a stationary piston, that causes the injected water to be " thrown off by the motion of the cylindric one."

In another form there are "two or more cylinders, one stationary, " the other moving within it."

5. A "hydrostatic bellows." One cylinder is inserted with its open end in a cylinder containing water, and is pressed down so as to blow out the air through a tube rising inside above the water. Air is admitted again through a valve opening inwards as the cylinder is raised.

6. Vessels are moved by forcing water through one or more trunks or tubes along the keel, as explained in a former Specification (N° 1673, *ante* p. 38) referred to by the patentee.

7. Vessels are propelled by frames under water, moving in grooves, and carrying poles which hang on an axis, and reach the bottom of the sea or river.

8. Poles thus moved are used to impel carriages on land.

9. A paddle-wheel, projecting from the bow of a vessel, is turned by the force of the current, and by cranks connected with it moves poles, which push against the bottom and propel the vessel against the stream.

10. "In employing my engine, that works with equal force (or " any other agent) to produce effects that require a rotary motion, " I make use of ratch wheels (as described in the above-recited " Specification)." Several improved methods of applying these " wheels are explained.

11. A large vessel to be used as a floating dock has gates "that " open outwards, which, when opened, lets the machine sink deep " enough to slide it under a ship, which passes through the afore-" said gates; when the ship is in and shored up, the gates are " closed, and the water pumped out of the machine."

12. "I also fix wheels and chains, similar to those above de-" scribed, between two vessels joined together and moored or " otherwise confined in strong currents of water, by which wheels " I turn mills or any other mechanism, or raise water for cities or " other purposes."

13. The steam pistons may be connected to "bolts or rods that " immediately give motion to carriages, and poles fixed within the " vessel as before described."

14. "When I cause the steam or vapor arising from stills to " work engines, I cause the liquor to be received into a vessel " exhausted of air, from which it is pumped by the engine or " otherwise."

15. "My improvement on the steam wheel, represented in " figure 16 of my former Specification" (N° 1673, *see ante* p. 38), " consists in forming such wheels of but one single tube or rim, or " of several that are connected, but not wound spirally round the " wheel."

(Printed, 1*s.* 4*d.* Drawings. See Woodcroft on Steam Navigation, p. 49. Rolls Chapel Reports, 6th Report, p. 182.)

A.D. 1790, August 17.—N° 1771.

STANHOPE, Charles Earl.—" An improved method of " moving ships and vessels against wind, waves, current, or tide, " or against the power of them all, all united."

1. An opening is made through the vessel from top to bottom, and its sides secured against the water. A beam suspended from the top vibrates fore and aft in the water in the opening, with its sharp edge towards the direction of motion, and carrying at the lower end two vanes, which open like the leaves of a book when moved one way, and close against each other for the return stroke. The beam and vanes, when at the end of the stroke, are to be made fast in a recess in the opening when the vessel is in shoal water. The beam strikes a spring at the end of each stroke, the reaction of which changes the direction of the beam's motion smartly.

2. To keep the water depressed in the opening at the bottom of a vessel used for propelling apparatus (especially when the return stroke of a propeller is made through the air), the upper part of the cavity in the vessel may be made air-tight, and the air condensed within it by a force pump.

[Printed, 11*d.* See Partington on the Steam Engine, p. 51; Rolls Chapel Reports, 6th Report, p. 183.]

A.D. 1791, February 10.—N° 1792.

MANWARING, ISAAC.—1. A steam engine with two cylinders, one on either side of a toothed wheel, turned back and forward by racks on the piston rods.

2. When continuous rotary motion is desired each racked piston rod gears into a toothed wheel free on the shaft to be turned, but connected by a pall with a ratchet wheel fixed on the shaft, so that the motion of the piston rod drives the shaft round only one way. Four cylinders may be employed, and a fly wheel used.

[Printed, 10*d.* Drawings. Rolls Chapel Reports, 6th Report, p. 184.]

A.D. 1791, May 24.—N° 1807.

RIDGE, SAMUEL.—1. Fluted cylinders are placed side by side in a case, with their grooves fitting each other. If they are caused to revolve they will act as a pump.

2. This pump may be driven by a rotary steam engine, consisting of two fluted rollers or sets of arms revolving in constant contact with each other, and with as little friction as possible. These are placed in a steam-tight case, and steam being admitted at one side of the part where the rollers or two sets of arms touch, while the steam from the other side is condensed, the arms or rollers will be forced round. When there are only a few arms on each set their axles should be connected by toothed wheels.

3. The rollers may be made cylindrical, and instead of being fluted they may have several hinged arms on their surfaces, which, as the rollers rotate, pass air-tight along the space between them and the case, and fold down into recesses when they arrive successively at the point where the rollers touch.

4. A rotary steam engine consists of a cylinder revolving in a steam-tight case, leaving an interval between the circumference of the cylinder and the case, which is traversed, as the cylinder revolves, by one or more arms fixed to the cylinder, and fitting steam-tight to the case, but which arm or arms fold down as they successively pass a fixed stop piece projecting from the case, and fitting the interval between it and the cylinder.

The ends of the cylinder revolve with packing, to prevent steam from passing from one side of the axle to the other, except by the interval round the outside of the cylinder.

If the steam be forced into the case at one side of the stop piece, and a condenser attached to the other side, the cylinder will be moved round. The stop piece may be placed on the cylinder, and the hinged pieces on the inside of the case.

The steam may be admitted to the case through one end of the axle of the cylinder, made hollow, and it may be discharged through the other.

5. Instead of a cylinder revolving a circular plate may revolve close to one side of a cylindrical case, and with square valves upon its side, near the edge, projecting into the annular groove between the case and an inner cylinder.

The valves are hinged and close as they pass a division made across the groove, and which here acts as the stop piece already described, the rest of the action being also similar to that explained.

6. A force pump is constructed by making a vertical cylinder and stop piece revolve in a case with a hinged valve similar to that described for the steam engine (4). A pipe from a well enters the case at the bottom at one side of the valve, and the rotation of the cylinder moving horizontally drives the water up another pipe inserted in the top at the other side of the valve.

7. A rotary pump on a similar principle to that described. The water enters the case through the axle of the cylinder, which revolves vertically, and it is discharged from the outer periphery of the case.

After explaining the application of the steam engine to propel carriages, and of the pumps to throw jets of water, the patentee says (line 5 from the end of the lithograph description on the drawing): "The steam engine may likewise be applied to moving vessels in water."

[Printed, 1*s*. 5*d*. Drawings.]

In A.D. 1791, Fitch patented in France a mode of propelling by steam (*a*).

A.D. 1792, June 14.—N° 1890.

SILVESTER, George.—1. A horizontal windmill consists of an upright shaft, with two sets of arms revolving upon it, and which carry between them long vertical vanes. By means of a crown wheel on the shaft gearing into a pinion on a spindle turning a

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(*a*) By swinging oars. See Brevets d'Invention, vol. 2. p. 105. (French patents, after A.D. 1791, are therein recorded). See pp. 34, 36, *ante*.

wheel on the axis of each vane, the vane is caused to present to the wind its flat side when it is on one side of the main shaft, and its edge when it comes round to the other. To equalize the speed, a directing vane keeps the machine in the most favourable position for the action of the wind, but when this is too strong, the upright shaft is partly turned round by the pressure of the wind upon the vane, and the action of the crown wheel on its top thus causes the mill vanes to be presented in a less favourable position for the action of the wind.

2. Feathering paddles. "The same motion may be likewise "applied to floats of water wheels, or to the working of common "boats without oars;" the arms carrying the vanes or paddles would then turn vertically.

3. Vanes turning on pivots connected by two endless chains, which move horizontally round wheels, are made with an unequal amount of surface on the two sides of the axis of each, so that the wind blows them open, and they are kept in an oblique direction towards it by cords, while the wheels are moved round.

[Printed, 9*d*. Drawings.]

A.D. 1792, July 24.—N° 1903.

RUMSEY, JAMES.—1. A mill on the principle of Barker's mill.

2. A centrifugal pump.

3. A wheel with internal projections like vanes by which it is turned by water.

4. An axis with a screw on it turned by a stream of water. The axis may be horizontal, or at an angle, or vertical, and open above or enclosed.

5. Between two boats fixed side by side a frame supports an axis in the water carrying a screw, "the axis G, H, being moved by "horses, by steam, or by men, or any other power applied to the "cogg-wheel N, when the boat will take motion." The axle and screw may be used "before or behind a single boat, or in their bottoms."

[Printed, 10*d*. Drawings. See Rolls Chapel Reports, 6th Report, p. 186.]

In June, A.D. 1793, a steam-boat made on Rumsey's plan (Patent No. 1673, *ante*,) was used on the Thames (*a*).

(*a*) Woodcroft on Steam Navigation, p. 51.

In June, A.D. 1793, John Smith used a steam-boat with paddle-wheels on the Duke of Bridgewater's canal from Runcorn to Manchester (*a*).

A.D. 1794, July 15.—N° 2000.

LYTTLETON, WILLIAM.—1. A screw propeller, consisting of a cylindrical frame formed by two sets of spokes, supporting bars between them. Within the frame are "sweeps fixed at right "angles, and on an angle of 35° with the axis." Their position is represented like a screw with three threads.

2. In another form, what is called a "skeleton cylinder" is constructed like the former, but the sweeps are to be placed outside the frame, so that the machine may be easily taken to pieces.

Frames are shewn for attaching the propeller to the bow, stern, or side of a vessel, and it is to be caused to rotate by hand power or a steam engine.

[Printed, 6*d*. Drawings. See Mechanics' Magazine, vol. 43, p. 353; Bourne on the Screw Propeller, p. 11; Lyttleton's propeller was tried before A.D. 1827, Tredgold, Appendix D., p. 8.]

A.D. 1794, July 16.—N° 2001.

FITZGERALD, WILLIAM.—1. A vessel is propelled by vanes on an endless band, carried by wheels at each side, and dipping into the water.

2. A vane at each side of a vessel acts upon the water, the movement being directed by a crank, which gives motion, and by fixed guides acting on a rod connected with the vane.

[Printed, 1*s*. 11*d*. Drawings.]

In A.D. 1796, Théloirier patented in France a method of propulsion by currents of air and water (*b*).

A.D. 1796, May 3.—N° 2106.

MILLER, PATRICK.—A flat-bottomed vessel is "put in motion "by wheels, which project beyond the sides of the vessel, and are "wrought by capstans. The wheels are built with eight arms, which

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(*a*) Mechanics' Magazine, vol. 17, p. 260. "The vessel had on her an engine on the old atmospheric principle, was worked with a beam, connecting rod, double crank, in a horizontal line, and with seven paddles on each side, which propelled her after the rate of two miles an hour." Nautical Magazine, 1832, vol. 1, p. 602, quoting from a Hull paper.

(*b*) Bourne on the Screw Propeller, p. 12.

"consist entirely of plank." Sliders placed from stem to stern in the centre of the vessel are raised or let down to keep the vessel to windward under sail.

[Printed, 3*d*. No Drawings. See Repertory of Arts, vol 6, p. 18. Woodcroft on Steam Navigation, p. 42. See also references *ante* p. 36., note *c*.]

A.D. 1796, July 20.—Nº 2131.

POTTS, Thomas.—A long beam, properly weighted, is suspended by framework over a vessel in the direction of its keel. From one end hangs a broad vane or oar rigidly fixed to the beam; at the other end are cross bars, by which men propel the vessel, by working the beam so as to pull or push the vane against the water, and take it out for the return stroke.

[Printed, 6*d*. Drawings. See Repertory of Arts, vol. 6, p. 160.]

In A.D. 1796, R. Fulton published a plan for using small canals in navigation, and for raising and lowering vessels on them by inclined planes (*a*). He also used apparatus for propelling vessels under water, to be employed in war.

In A.D. 1796, E. Thomason described a fire ship to be moved by a steam engine which would turn paddle-wheels, act on the rudder at certain intervals, and after an assigned period pull a trigger to set fire to combustibles (*b*).

In A.D. 1796, it was published, that Serrafino Serrati, an Italian, had placed a steam-boat some time before on the Arno, near Florence (*c*).

In A.D. 1796, a Dutchman used horses and ponies to propel a boat on the Ohio by paddle wheels (*d*).

A.D. 1797, October 31.—Nº 2197.

HARRIOTT, John.—To the lower part of a capstan is fixed a cog-wheel, which works two or more other wheels, each with a crank working a pump.

(*a*) Stuart's Anecdotes of Steam Engines, vol. 2, p. 478.

(*b*) "Description of a new invented fire ship (to be moved by steam) that will "conduct herself into an enemy's port without any person being on board, with "an exact drawing of the model, as laid before the Admiralty in October 1796, by "Mr. Edward Thomason, of Birmingham, with a plate." See a copy (with a drawing) in Woodcroft's MS. Collection.

(*c*) "Elements of Experimental Physics." Florence, 1796, quoted in Scott Russell on Steam and Steam Navigation, p. 238. See note (*d*) p. 36, *ante*.

(*d*) Extract from an unpublished work, entitled "Journal of a Tour in unsettled parts of North America in 1796 and 1797, by the late Francis Baily;" printed by Baily Brothers, Royal Exchange Buildings, London, A.D. 1856, p. 327

2. A segment of a cog-wheel fixed to a capstan works the pump by a backward or forward motion of the capstan.

3. A double-handled lever, with its fulcrum between two pumps, works both of them as it is raised and depressed. The piston of such a pump is made to move with proper parallel motion by a guide steadying the piston rod, while the piston is attached to the handle by slings.

4. The motion of a vessel through the water is caused to turn a "waterwheel," which works the capstan and pumps.

5. Water pumped from bow of a vessel is discharged towards the stern below the surface of the water outside.

6. Water from the pumps is made to turn a wheel outside, the fans of which "taking the surface of the water would operate as oars."

[Printed, 6*d*. Drawings. See Repertory of Arts, vol. 9, p. 361.]

A.D. 1797, October 31.—N° 2200.

BEATSON, Robert.—1. A horizontal double wheel carries broad vanes between the two sets of spokes, with the surface of each vane in compartments, arranged as louvre boards turning on pivots at the end of each board. The wind or water turns the wheel by pressing on the boards as they close during one part of their revolution, and passing through them when they partly open as they come round against the wind or water.

2. Louvre boards applied to the piston of a pump, to ventilation, to smoke prevention, and to the bottom of a bucket.

3. A vane thus divided into louvre boards may be used to propel a vessel by moving it backwards and forwards.

[Printed, 7*d*. Drawings. See Repertory of Arts, vol. 2 (*second series*), p. 13.]

A.D. 1798, August 23.—N° 2260.

DODGSON, George.—"Certain pumps and engines for raising "and evacuating water or other fluids, and for producing power; "and is peculiarly adapted for the use of ships and vessels." Pumps worked by cranks in various modes (but without further allusion to propulsion).

[Printed, 6*d*. Drawings.]

In A.D. 1798 Robert Fulton tried successfully to propel a boat with a four-bladed screw propeller (*a*).

(*a*) Letter from R. Fulton in a Memoir of E. Cartwright, London, 1843, p. 143, extracted, with a drawing in Woodcroft's MS. Collection.

A.D. 1799, January 5.—N° 2286.

KENT, JOHN.—A weight of six tons moved to and fro along a lever over the fulcrum raises a weight of one ton at the end. Drawings show "the same principle applied to rotative motion" by wheels; "the great difficulty in mechanicks of gaining power "without losing time is overcome." The power is to be applied to move a ship.

[Printed, 6*d*. Drawings. See Rolls Chapel Reports, 6th Report, p. 147.]

A.D. 1799, October 3.—N° 2346.

HOTCHKIS, JOHN.—"A new mechanical power for the purpose "of lifting weights, moving ships, weighing anchors, &c." Levers and weights are used, so as to "cause the weight which is to be "lifted to assist in lifting itself."

[Printed, 7*d*. Drawings. See Repertory of Arts, vol. 14, p. 24.]

A.D. 1800, February 4.—N° 2371.

SHORTER, EDWARD.—1. Beams with flat boards are suspended at the stern of a vessel and caused to dip into the water and propel the vessel by levers, cranks, or chains, worked from a capstan or otherwise.

2. "A perpetual sculling machine, having two blades or more "similar to the sails of a windmill set in the same angular direc- "tion," is caused to rotate under water at the stern by a shaft with a universal joint, which allows the shaft to be drawn to one side or another, so as to steer the vessel while it propels her. The action is that of a two-bladed screw propeller.

3. Cranks move two sets of vertical vanes in wells within a vessel open below. The vanes act alternately against the water.

[Printed, 9*d*. Drawings. See Repertory of Arts, vol. 5 (*enlarged series*) p. 173, also vol. 14 (*enlarged series*), p. 241; Bourne on the Screw Propeller, p. 12, where it is said that Shorter contemplated the application of his screw at the bow in the dead wood. For accounts of trials of this invention in A.D. 1802, see notice under that year.]

A.D. 1800, March 19.—N° 2380.

STEERS, EDWARD.—A beam projecting from the side or end of a vessel supports an upright axis on which a frame turns to the right or left by the action of a lever.

From the frame planks reach to the water, and being hinged to the frame like window shutters with stops to prevent them from moving in one direction, they are caused to present to the water a broad side and a narrow edge alternately.

[Printed, 6*d*. Drawings.]

In July, A.D. 1801, R. Fulton experimented at Brest with a submarine boat (*a*).

A.D. 1801, October 3.—N° 2541.

TREMEERE, JAMES.—1. Two paddle-wheels are supported in a frame on two beams projecting over the end of a vessel.

The frame may be raised or lowered by ropes, so as to place the paddle-wheels in the most favourable position.

The vanes are sometimes hinged and fold up when in harbour.

The wheels are to be turned by hand-power or by weights.

[Printed, 11*d*. Drawings.]

A.D. 1801, October 14.—N° 2544.

SYMINGTON, WILLIAM.—1. The piston rod of a steam engine is connected to the crank of the wheel by a connecting rod, and turns the wheel by direct action without a beam.

2. The application of such an engine to propel a vessel by paddles on a wheel on the shaft in the middle of the vessel, or at each side, or between two boats.

3. The same engine applied to break ice by moving stamping rods at the vessel's bows.

[Printed, 6*d*. Drawings. See Mechanics' Magazine, vol. 20, p. 98; Woodcroft on Steam Navigation, p. 55; Rolls Chapels Reports, 6th Report, p. 151.]

A.D. 1801, October 30.—N° 2546.

BRAYSHAY, RICHARD, and MC MAHON, WILLIAM.—1. Vanes or sails are arranged between two wheels on the same shaft. "The "sails or float-boards are so contrived as to be able to play in "a given space, being fixed perpendicularly on the wheel and "fastened by a cord or otherwise, so that when the wind blows "from any quarter three-fourths of the sails catch the wind, and "by forcing the wheel round those sails which are forced against

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(*a*) Stuart's Anecdotes of Steam Engines, vol. 2, p. 481. This was for Napoleon Buonaparte. He again used the invention (for the English), ibid., p. 487.

" the wind come up edgeways, but when past the centre imme" diately receive the breeze, and by that means produce a con" tinued circular motion."

"This may be better understood by supposing the method which " is taken to make a vessel sail against wind by tacking about. " In some cases where we may judge it necessary we place two " sails together opening as it were a book."

The machine is used to row a boat by causing an upright shaft to turn with "a half circle wheel" upon it (acting apparently like a cam) to move backwards and forwards a frame connected with " the winged oars." These oars are beams with vanes hinged on them on each side, and which open like the leaves of a book when driven against the water and collapse for the return stroke.

2. On the shaft of a windlass or capstan are fixed ratchet wheels. These may be worked by levers carrying palls, so as to turn the shaft when the levers move one way, and to shift the palls over the wheels when the levers go the other way.

3. A windlass which expands or contracts in diameter by the action of two circular plates at each end of the barrel, one with radiating slits through which the bars pass, and the other with spiral grooves in them carrying the ends of the bars forming the barrel.

4. A weighted frame, being inside the vessel, is at liberty to move backwards and forwards according to the motion the vessel gives it, and thus to turn the levers of the windlass, which by cranks on its axis works the winged oars.

5. A frame moveable on a pivot, by which the height of the rowlocks used for common oars may be adjusted.

[Printed, 7*d.* Drawings. See Repertory of Arts, vol. 1 (*second series*), p. 11.]

A.D. 1802, January 28.—N° 2576.

SHARPLES, JAMES.—1. "Giving motion to rollers and drum " wheels, within cylinders or parts of cylinders, by means of the " same portion or body of water or other fluid forced by the " pressure of steam against the said drum wheels or cylinders, or " against valves, wings, buckets, or other resisters attached thereto."

2. Arrangements for equalizing or counterpoising pressure in Newcomen's engines.

3. A vessel is propelled by a mill on a horizontal axis, with vanes acting against the air in one direction, and feathering as they mov

round by pullies on their axles, connected by ropes with a sheave on the main axle; the mill is turned by a steam-engine. In another plan, vanes dipping in the water move in a horizontal circle about an axle suspended over a vessel's stern, and the vanes feather by the method already explained. (The figure referred to in describing this, at p. 7, line 9, of the Specification, is apparently that which is not numbered under fig. 33 of sheet 3 of the drawings; several figures bear the same numbers.) A vessel is propelled by the motion of a lever alternately drawing and pushing a "collapser," which lays hold of a rope fixed on the side of a canal.

4. Arrangement of boilers, air-pumps, condensers, and pistons.

[Printed, 1*s*. 2*d*. Drawings. See Rolls Chapel Reports, 6th Report, p. 150.]

In March, A.D. 1802, W. Symington used on the Forth and Clyde Canal a steamboat (the Charlotte Dundas), with one paddle-wheel at the stern (*a*).

In July, A.D. 1802, the screw propeller (Shorter's patent, see *ante*, N° 2371) was tried in H.M. ships Dragon and Superb (*b*).

In January, A.D. 1803, R. Fulton described some experiments with paddle-wheels, from which he was convinced that their use would be more advantageous than that of the "chapelet," or endless band of floats. He also proposed so to form the bows and sterns of boats to be towed in line that, being convex and concave, they would fit into each other, and form a line of boats with almost continuous sides, and free to bend at the points where the ends of the boats touched each other (*c*).

A.D. 1803, January 29.—N° 2676.

MATCHAM, George.—A barge is raised to an upper level on a canal by a weight falling into the water, and drawing the barge along an inclined plane. The weight has a leather balloon attached, which is inflated to raise the weight for repeating the operation.

[Printed, 3*d*. No drawings.]

(*a*) Woodcroft on Steam Navigation, p. 54 (drawing); see p. 37 *ante*.

(*b*) Tredgold's Appendix D., p. 4.

(*c*) See Letter from R. Fulton to Citizens Molar, Bandell, and Montgolfier, No. 147; Paris, le 4 Pluviôse, An. xi. (A MS. copy is in the Great Seal Patent Office Library); Brevets d'Invention, tom. 20, p. 13; tom. 21, p. 231.

In A.D. 1803, R. Fulton and Livingstone launched a small steamboat with paddle-wheels, on the Seine (*a*).

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tion, p. 203. This is referred

er," in Annales des Arts et Manufactures, vol. 20, p. 329; Pluviose, An. xiii. (A.D. 1805.)

(*b*) Woodcroft on Steam Navigation. The boat went from Hoboken to New York, and was the first to cross the sea.

(*c*) Thomson's Annals of Philosophy, vol. 12, p. 75. See notice, p. 68, *post*.

(*d*) See Repertory of Arts, vol. 7, second series, p. 457.

(*e*) Woodcroft on Steam Navigation, p. 60, (drawing). This vessel was the first that plied for practical purposes and the remuneration of the owners, between New York and Albany. Stuart's Anecdotes of Steam Engines, vol. 2, p. 488.

round by pullies on their axles, connected by ropes with a sheave on the main axle; the mill is turned by a steam-engine. In another plan, vanes dipping in the water move in a horizontal circle about an axle suspended over a vessel's stern, and the vanes feather by the method already explained. (The figure referred to in describing this, at p. 7, line 9, of the Specification, is apparently that which is not numbered under fig. 33 of sheet 3 of the drawings; several figures bear the same numbers.) A vessel is propelled by the motion of a lever alternately drawing and pushing a "collapser," which lays hold of a rope fixed on the side of a canal.

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In May, A.D. 1804, J. Stevens, in America, tried a steam-boat propelled by a screw propeller turned first by a rotatory engine, and then by Watts' reciprocating engine (*b*).

In A.D. 1804, J. Boaz tried a screw propeller (*c*).

A.D. 1805, July 19.—Nº 2868.

SCHMIDT, Johan Gottlieb Frederic, and DICKINSON, Robert.—1. A metal vessel with glass windows contains men or lights under water. Oxygen is supplied for respiration or combustion from a self-acting reservoir. The vitiated air is freed from carbonic acid gas by providing for its absorption by caustic alkali on shelves. If the air is exposed to the water at the bottom of the bell, the use of the alkali is omitted, as the water absorbs the carbonic acid.

2. In another form a moveable bell covers the upper edge of a tubular vessel closed below.

The lower edge of the bell projects below the upper edge of the vessel, and is so far outside of it as to allow the hands of a person within the vessel to work between or to use oars outside for propulsion.

3. By admitting oxygen to the bell from a reservoir, the water may be driven out, so as to lighten the bell and cause it to rise, acting like the air bladder of a fish.

[Printed, 7*d*. Drawings.]

In A.D. 1805, Desquinemare proposed to propel ships by the Panemore, a globe turned by wind (*d*).

In A.D. 1807, R. Fulton launched a steam-boat on the East river in America. This vessel (the Clermont) was propelled by engines made by Boulton and Watt, in England (*e*).

(*a*) Scott Russell on Steam and Steam Navigation, p. 203. This is referred to as 8 or 9 feet broad, and used "last summer," in Annales des Arts et Manufactures, vol. 20, p. 329; Pluviose, An. xiii. (A.D. 1805.)

(*b*) Woodcroft on Steam Navigation. The boat went from Hoboken to New York, and was the first to cross the sea.

(*c*) Thomson's Annals of Philosophy, vol. 12, p. 75. See notice, p. 68, *post*.

(*d*) See Repertory of Arts, vol. 7, second series, p. 457.

(*e*) Woodcroft on Steam Navigation, p. 60, (drawing). This vessel was the first that plied for practical purposes and the remuneration of the owners, between New York and Albany. Stuart's Anecdotes of Steam Engines, vol. 2, p. 488.

A.D. 1808, July 5.—N° 3148.

TREVITHICK, Richard, and DICKINSON, Robert.—1. A paddle-wheel placed in a box closed above and open at bottom in the middle of a vessel with two keels is used for propulsion, the water being kept down by condensing the air in the box.

2. To tow a ship against a strong stream the vessel with machinery is connected by a rope to the ship, and this is unwound as the towing vessel moves, while the ship is kept fast by poles or anchors. The towing vessel is then made fast, and the engine turns a capstan, which winds up the rope and thus tows the ship.

3. A chain properly buoyed and secured by an anchor is wound once round a windlass on a vessel's deck, which is then set in motion and thus propels the vessel.

4. A vessel with an engine working several bands is brought near one or more vessels, and the bands are used to unload them by hauling up baskets or buckets and supplying power for other purposes.

[Printed, 4*d.* No Drawings. See Repertory of Arts, vol. 15 (*second series*), p. 1; and Rolls Chapel Reports, 7th Report, p. 107.]

A.D. 1808, July 14.—N° 3152.

LINAKER, James.—1. One or more tubes along the keel of a vessel and under the water are furnished with valves at each end, which are self-acting, but may be reversed.

In each tube is a plunger, with a valve like that af a pump, and an engine in the vessel causes the plunger to move so as to take in and discharge the water through the tube, and thus propel her forwards or backwards as the valves may be arranged.

2. The tubes being as explained, the motion may be given to the water in them by a pump in a separate tube within the vessel.

[Printed, 1*s.* 4*d.* Drawings. See Repertory of Arts, vol. 16 (*second series*), p. 334; Partington on the Steam Engine, pp. 53, 219; Buchanan on Steam Propelling, p. 39, *et seq.*; Tredgold on the Steam Engine, vol. 1, p. 298; Stuart's Anecdotes of Steam Engine, vol. 2, p. 493 (note), (where it is said Watt tried Linaker's pump); Rolls Chapel Reports, 7th Report, p. 202.]

A.D. 1808, July 30.—N° 3157.

CURR, John.—1. A windlass or capstan to wind flat rope upon. As the flat rope winds over itself, and the amount of rope increases on the drum, a cog-wheel on the drum is used to increase the power and diminish the speed of the shaft.

2. Two flat ropes, or more, may be wound on the same capstan by constructing it with two separate barrels, loose, on the same shaft, and each fixed to a cog-wheel. A pinion-wheel, sliding on another shaft, may be geared with either of the former wheels, and thus wind up one flat rope after another, or wind the same rope on two barrels successively.

3. A method of using ropes for holding whales. Applying a friction break, worked by a lever, to retard the motion of the reel from which the rope runs out. The end of the rope is kept from running out by a knot and stop, while another rope is joined to it.

4. Another plan for joining a second line to the end of the first while it is reeling off without stopping. For this purpose the first line is wound on the reel by doubling its end upon itself, so that in unwinding the end is available for joining to the second line before the whole of the first is off the reel.

5. A conical iron with a ring is fixed on the end of a whale-line, so that when united by a knot to another line the joining knot shall run readily past the edge of ice or other obstacles.

[Printed, 7*d*. Drawings. See Repertory of Arts, vol. 14 (*second series*), p. 26; also, Rolls Chapel Reports, 7th Report, p. 107.]

In A.D. 1808, W. Boswell published a proposal for propelling vessels by forcing air through tubes under water (*a*).

A.D. 1809, April 29.—N° 3231.

TREVITHICK, Richard, and DICKINSON, Robert.

1. A floating dock.

2. Large ships, with decks, beams, and sides of plate iron.

3. Masts, yards, and spars of iron in plates, with telescopic joints, or screwed together.

4. Preparing and curving timber.

5. "A method of framing or putting together the hulls of ships "or vessels."

6. Buoys of iron.

7. A portable steam engine, applied to move an oar or to haul ropes in a vessel.

8. An oar moving in a "channel" retaining the water on the sides, and which channel is drawn forward with the oar, or separately. The oar may be like a piston, with valves opening for the return stroke.

(*a*) Repertory of Arts, vol. 26 (*second series*), p. 271.

9. Additions to the boiler for cooking, or condensing fresh water for drinking.

[Printed, 4*d*. No drawings. See Rolls Chapel Reports, 7th Report, p. 204.]

In A.D. 1809 " Fulton the First," a steam-frigate, was launched at New York (*a*).

A.D. 1810, June 19.—N° 3351.

LINDSAY, JOHN.—1. Light barges, attached at each side of a laden boat, are caused to raise it by screws, so that it may draw less water in passing shallows (*b*).

2. In a shallow river, boats are sunk and connected by tarpaulin, so as to dam up the current and deepen the channel for the passage of a laden vessel.

[Printed, 3*d*. No drawings. See Repertory of Arts, vol. 19 (*second series*), p. 12; Rolls Chapel Reports, 7th Report, p. 209.]

A.D. 1811, March 26.—N° 3423.

ROSE, JOHN, and CHAPMAN, THOMAS.—A covered passage or opening is made from stem to stern of a vessel, and open to the water below as well as at the ends. " In a frame firmly placed in the " said opening or watercourse we place one or more wheels or " cranks, of such form & dimensions as the nature of the vessel, " or the draught of the water she may make may require. The " wheels we construct principally after the manner of a water- " wheel, & hanging on an axle from the sides of the watercourse. " The cranks we form on the same diameter as the wheels." The cranks support beams with paddles, of such a breadth that one set may rise out of the water and pass the other set without touching. The paddles on the beam enter and leave the water in a vertical direction.

2. "In some cases we shall find it necessary to use a wheel, " either in the centre by itself, or at the opening part of the water- ' course, just within the bow, with a double or single crank & " paddles in the middle of the said watercourse, & a second wheel at the after part or just within the stem of the vessel. In some cases it will be most effectual to use one or more wheels in

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(*a*) Steinitz' Ship, p. 525; quoting an American newspaper of the day.

(*b*) Vessels used thus to float others are called " camels," (perhaps from " chamulcus," a sort of cart. Facciolati: Acta Eruditorum, 1740, p. 259.)

"the watercourse, & no cranks, & in others for passage vessels, "and on canal navigation in particular, one or more cranks will be "the most operative without the assistance of the wheels."

[Printed, 3*d*. No drawings.]

A.D. 1811, March 26.—N° 3426.

JAMES, Henry.—1. At the end of a vessel a steam engine works a shaft with paddlewheels, one on each side of the keel, in openings through the deck. The vessel is steered by two rudders at the sides, forward of the paddlewheels.

A stage or platform may be carried out under the paddlewheels, and level with the bottom of the vessel to protect the wheels and rudders.

2. "The oars, paddles, or propelling boards, instead of being "made as above described, & revolving or turning in the direction "of the lengthways of the boat or vessel, may be made like to the "vanes of a windmill or smoke jack, pressing obliquely against the "water, somewhat upon the principle of what watermen or sailors "call Sculling."

[Printed, 5*d*. Drawings. See Rolls Chapel Reports, 8th Report, p. 86.]

A.D. 1811, May 1.—N° 3441.

ADAMS, Stedman.—Pistons act alternately through two horizontal tubes under water along the kelson. The inner ends of the tubes are united, and the other ends are open to the water.

[Printed, 8*d*. Drawings. See Rolls Chapel Reports, 8th Report, p. 84.]

In October, A.D. 1811, the Comet was built by Bell at Glasgow (*a*).

A.D. 1811, July 19.—N° 3465.

TROTTER, John.—Water is drawn into a chamber by a piston, and expelled through apertures above or under the water line to propel the vessel.

[Printed, 6*d*. Drawings. See Repertory of Arts, vol. 20 (*second series*), p. 136; Rolls Chapel Reports, 8th Report, p. 85.]

(*a*) Memorials of James Watt, p. 218; Stuart's History of the Steam Engine, p. 182; Tredgold on the Steam Engine, vol. 1, pp. 44, 45, 470; Woodcroft on Steam Navigation, p. 81 (where there are drawings of the vessel and engines). The Comet had no mast, but a sail was rigged on the funnel. In Steinitz' Ship, the name given is "the Little Comet," p. 526. See notice under A.D. 1812, *post*.

In Jan. 1812, H. Bell used a steam-vessel (the "Comet"), between Glasgow and Helensburgh (*a*).

A.D. 1812, May 9.—Nº 3564.

HIGGINSON, Henry.—Endless bands travelling over wheels at the ends or sides of a vessel carry floats, which act in the water, and by means of pivots or hinges, or other similar constructions, are caused to lie flat when returning through the air (in a manner not described).

[Printed, 5*d*. Drawings. See Rolls Chapel Reports, 8th Report, p. 0.]

A.D. 1812, December 19.—Nº 3628.

MORGAN, John.—Beams reaching from a vessel to the water are caused to move by the rolling of the vessel and the action of the waves on buoys at their ends, to obtain power wherewith to pump or propel the vessel.

[Printed, 3*d*. No drawings. See Repertory of Arts, vol. 23 (*second series*), p. 298; Rolls Chapel Reports, 8th Report, p. 95.]

In March, A.D. 1813, "the Elizabeth" steam-boat plied on the Clyde (*b*).

A.D. 1813, April 28.—Nº 3686.

MEAD, Thomas.—1. A double endless chain moves round two indented wheels above and below two parallel tubes. On the chain belt are a series of pistons packed so as to pass steam-tight through the tubes. Steam from a boiler forces the pistons successively along one tube, at the end of which they are successively detained and released by catches, and pushed forward a small distance by excentrics. The steam escapes by a hole in one of the tubes, which is uncovered at proper times, as the pistons require it. Cranks from one of the wheels, turned by the belt, move rods shod with iron, which propel a carriage on which the machine is placed.

2. A regulator for supplying fuel, and a bellows and damper, are described.

(*a*) See notice, note (*a*), p. 57, *ante*. The original boiler of this vessel is in the possession of Mr. Scott Russell.

(*b*) Scott Russell on Steam and Steam Navigation, p. 219. "She was probably the first remunerating steam-vessel in the world." The first steam-vessel that plied on the Thames was called "the Margery." Steinitz' Ship, p. 527 (no date of the fact is given.)

3. The carriage wheels may be moved by cog-wheels worked by one of the wheels carrying the belt.

4. A pump (like a chain-pump) and an engine to extinguish fires, worked in a similar manner.

5. Paddles at the ends of rods receive a reciprocating motion from cranks moved by the machine already described, or the engine may work wheels at the sides of the vessel.

6. "In all these applications, if well conducted, the smoke is "completely destroyed, or rendered invisible."

[Printed, 1*s*. 1*d*. Drawings. See Rolls Chapel Reports, 7th Report, p. 114.]

A.D. 1813, May 22.—N° 3700.

BRUNTON, William.—1. Relates to land carriages.

2. A chain is made fast at one end to the ground, and levers and ratchets on board a vessel cause a 'gripe' to traverse the chain loosely in one direction. The gripe then lays hold of the chain and the machinery draws the vessel forwards along the chain.

3. Relates to land carriages.

[Printed, 7*d*. Drawings. See Repertory of Arts, vol. 24 (*second series*), p. 65; Register of Arts and Sciences, vol. 4, p. 442; Engineers' and Mechanics' Encyclopedia, vol. 2, p. 39; Partington on the Steam Engine, p. 226.]

A.D. 1813, October 18.—N° 3741.

BUCHANAN, Robertson.—1. Feathering paddles. There is fixed on one or on both ends of the parts of the shaft carrying each paddle-wheel an excentric wheel, which works smoothly in, and carries round with it a frame, from which a spoke radiates to each of the floats, and causes them so to turn on pivots at their ends that they enter the water, move in it, and leave it, with their edges vertical, or at any desired angle.

2. The same plan applied to undershot water-wheels, breast water-wheels, windmills, wheels for raising water, or for scraping or dredging the bottom of waters.

[Printed, 6*d*. Drawings. See Repertory of Arts, vol. 25 (*second series*), p 5. Carpmael's Reports on Patent Cases, vol. 2, p. 9; Buchanan on Steam Propelling, p. 51; Galloway on the Steam Engine, p. 309; Tredgold on the Steam Engine, vol. 2, p. 117; Hebert's Encyclopedia, vol. 2, p. 751.]

A.D. 1814, July 26.—N° 3823.

DUNNAGE, George.—1. The "stretcher" against which the feet are placed when rowing a boat is made moveable in a horizontal direction, and its motion is communicated by a lever and rods under the rower's seat to another lever behind him, which helps to move one or more of the oars by ropes, so that both the hands and feet of the rower act upon the oars. One hand and foot may move each oar, or an additional oar may be moved by the feet.

[Printed, 6*d.* Drawings. See Repertory of Arts, vol. 27 (*second series*), p. 8.]

A.D. 1814, July 26.—N° 3827.

DONCASTER, William.—1. A vessel constructed "to act as " a sort of travelling mill, if not a fishing vessel also; and in its " mode of navigation to enable the mariner to perform the greatest " parts of his duties comfortably under cover." A vessel of 200 feet long "will then carry thirty of the sea-horse wheels twenty " feet diameter and two broad." There are various hulls and keels, between which works an apparatus of wheels, syphons, and racks with cast-iron sail frames, bellows, and other engines, the particular operation of which is not clearly described.

2. " An hydrostatic or other mill."

[Printed, 6*d.* Drawings. See Rolls Chapel Reports, 8th Report, p. 106.]

A.D. 1814, August 4.—N° 3830.

THOMPSON, James.—1. "A dead water relieving piece to be " shipped on the after part of a vessel's rudder to remove the dead " water which that part of the rudder makes when she has direct " way, to obviate the counteraction when she has sternway, and to " add to the effect of the rudder in casting the vessel round."

A long piece of wood with a triangular section is lowered by ropes with its sharp edge turned aft, and its other edge applied to the rudder down which it slides directed by a feather and groove until the lower end reaches the bottom of the rudder, and is embraced by metal stays projecting aft from each side of the rudder.

Two keys in the sliding piece take into corresponding locks in the rudder to prevent the piece from rising, and a triangular iron turns in the top of the after part of the rudder, and falls over the top of the sliding piece to make all secure.

2. Directions are given for the proportions of the several parts of a rudder and "relieving piece."

3. A section of a rudder is shown "with chocks of metal or wood " bound with iron attached to them to support the twist of the

"gudgeon which may be let into the rudder and sternpost & "bolted through."

4. "A rowing paddle" to be used as a jury rudder, or in light winds to propel the vessel. This consists of a broad vane on a bar fitting into a frame attached to a mainpost as a vertical axis, which turns (like a rudder) on pintles secured by a crow-foot to the vessel's side. The rod and paddle may be raised or lowered by a lever on the top of the mainpost, and secured by a rope. A handle or tiller turns the mainpost, and moves the paddle in the water.

5. "A steering paddle" to add to the effect of the rudder, consists of an oblong flat piece with locks which take into keys in the after part of the rudder. The paddle is lowered into its place by a rope, and directed by a strong diagonal piece projecting from the paddle, and bolted when it is secured in its place to the side of the rudder.

6. Cast iron ballast is formed of two similar pieces united by a tie, and placed on either side of the keel inside a vessel, "instead "of the timber boards now in use."

[Printed, 6*d*. Drawings.]

In February, A.D. 1815, B. Smythe suggested the use of a windmill on a vertical shaft for working paddle-wheels with vanes on hinges (*a*).

A.D. 1815, April 25.—N° 3909.

PAULY, SAMUEL JOHN, and EGG, DURS.—1. A balloon of an oblong shape horizontally is to be moved and steered by fans with elastic ribs, having silk or light stuff stretched on them, and placed like feathers on either side, and behind the framework carrying the machinery. The fans are fastened by cords, which give them a reciprocating motion either by manual or mechanical power.

2. The patentees "declare that the same principle is also appli- "cable to the propelling of vessels through the water."

[Printed, 4*d*. No drawings. See Repertory of Arts, vol. 31 (*second series*) p. 17. Rolls Chapel Reports, 7th Report, p. 116.]

In A.D. 1815 (May 28), Dr. Dodd went from Glasgow to London in the steam vessel "Thames" (built on the Clyde) (*b*).

(*a*) Repertory of Arts, vol. 29 (*second series*), p. 156.

(*b*) See Frazer's Magazine, No. 225, p. 275; also Arts and Industry in the Kingdom of Bavaria, for February 1816 (published in German, see copy in Great Seal Patent Office Library), No. 5, p. 70 (note), where the vessel is referred to as steaming from Dublin to London (the "Thames" having called at Dublin,

A.D. 1815, June 6.—N° 3922.

TREVITHICK, Richard.—1. Steam issues from apertures near the ends of a tube, which turns on pivots, as in Hero's engine.

2. Steam forces water to move a piston in a cylinder, as in the common high-pressure steam engine.

3. Steam forces water to issue from apertures near the ends of a tube, revolving as in Barker's mill.

4. A screw propeller, consisting of "a worm or screw, or a "number of leaves placed obliquely round an axis, which revolves "in a cylinder, fixed or revolving, or without a cylinder, at the "head, sides, or stern of a vessel. In some cases the screw is "made buoyant, and works on a universal joint."

"Second Specification." "A part of the said invention having "been, through error, omitted in the said Specification" (the first), "I am now desirous of correcting the same." The additional matter introduced is, 1. A stuffing-box, enclosing a ring of water. 2. Modifications in the arms of the rotary engine, like Hero's engine.

3. Steam moves a piston in a cylinder, and forces water to work another piston in another cylinder.

4. Flat plates on the revolving arms, turned by water forced through them by steam, or a revolving screw to create a draft.

5. "A boiler of a number of small perpendicular tubes, each "tube closed at the bottom, but all opening at the top into a "common reservoir."

[Printed, 6*d*. No drawings. See Partington on the Steam Engine, p. 228; Galloway on the Steam Engine, p. 217; Repertory of Arts, vol. 28 (*second series*), p. 140; also vol. 5 (*enlarged series*), pp. 121, 173; Register of Arts, and Sciences, vol. 4, p. 459; Engineers' and Mechanics' Encyclopedia, vol. 2, p. 408; Rolls Chapel Reports, 8th Report, pp. 105, 106.]

A.D. 1815, June 22.—N° 3932.

DICKINSON, Robert.—1. "On the axis of the paddle-wheels "which lays across the boat, I fix one or more swinging frames, 'so contrived that when a man or men sit on a seat their hands

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where Mr. Weld, Secretary of the Royal Society, joined as a passenger.) The drawing represents a steam-boat with one mast, and sails on the funnel used as another mast. This steamer was originally called the "Argyle." She was of 70 tons register, 79 feet long, and 16 feet beam, with engines of 14-horse power, consuming a ton of coals for every 100 miles. She carried 15 tons of coals. The paddle-wheels were 9 feet in diameter. She steamed 758 nautical miles in 121¼ hours. A detailed account of the voyage is given in Chambers' Edinburgh Journal, No. 173, April 25, 1857.

" may lay hold of the upper part and pull it to them, while with " their feet they push the lower part from them; the centre of " motion being the axis of the wheels, a ratchet wheel is fixed on " the spinder or axis, & a paul on this swinging frame, so that " every time the man pulls with hands & pushes with his feet " the paul catches the ratchet wheel, and turns the paddle-wheels " a part of a revolution." When the vessel is small, the swinging frames may be fixed on a separate axis, with a toothed wheel working a pinion on the paddle shaft. The paddle-wheels may be detached and worked by separate frames.

2. Oars are described with blades broader than ordinary, and made of iron, and that part of the oar which works in the rowlock may be made of iron tube, so as to retain the buoyancy of the oar when it falls accidentally into the water, and at the same time to give additional strength.

3. Vessels are to be made of iron with a hollow water-tight gunwale, or with both ends covered in water-tight, or with water-tight seats along the sides as well as across within the vessel.

[Printed, 3*d*. No drawings. See Repertory of Arts, vol. 28 (*second series*), p. 138.]

A.D. 1815, December 19.—N° 3969.

KINDER, Robert.—The after part of the hull of a vessel is constructed with one or two cisterns or wells, open at bottom and at the after end, and with the top sloped upwards from the keel, where the cistern meets it forward to a requisite distance above the watermark aft where the after end of the cistern terminates.

If two cisterns are used when the vessel has one keel, the division between them is a continuation upwards of the keel, which may in small vessels support machinery for propelling them.

In these cisterns paddles or paddle-wheels may be worked, entirely enclosed within the sides of the vessel and forcing the water against the rudder.

[Printed, 3*d*. No lithograph drawing, but a woodcut at p. 3. See Repertory of Arts vol. 28 (*second series*), p. 261; Rolls Chapel Reports, 8th Report, p. 115.]

A.D. 1816, February 1.—N° 3977.

MILLINGTON, John.—1. Upon a shaft turning under water at the head or stern of a vessel " are fixed one, two, or more vanes or " sails of plate iron, copper, or other materials, with sufficient ribs " or braces of iron capable of making them stiff, and capable of

“ maintaining the form which may be given to them. These ribs
“ are placed in an angle of 45 degrees to the plane of their motion,
“ which lies at right angles or perpendicular to the axis of the bar,
“ so that when the bar is turned round upon this axis it likewise
“ moves the vanes in the manner of the fly of a smoke-jack; but
“ the propeller differs from this, inasmuch as the surface of the
“ vanes must not extend to each other, but must have spaces be-
“ tween them like the sails of a windmill, to allow the free escape
“ of the water; and I find that two vanes, each extending to about
“ the quadrant of a circle, produce a greater effect than any other
“ number, though I reserve to myself the right of using a greater
“ or less number of them, as well of making them to shift on their
“ pivots or points of attachment, so as to alter the angle which
“ they make with the plane of their motion from forty-five degrees
“ to any greater or less angle, according to the speed with which
“ they are moved, or the velocity which I wish to communicate to the
“ vessel, and I retain them in any angle in which they may be set
“ by one or more of the braces or stays which pass from the side of
“ the vane to the shaft or bar upon which it is fixed. At the
“ other end of this shaft or bar is a Hook's or universal joint, such
“ as is well known to mechanists, by which it communicates with
“ a short turned or circular shaft, having a shoulder formed
“ upon it so as to work in a water-tight manner through a *shifting*”
(stuffing?) “ box of the common & well-known form, which stuffing
“ box & shaft are made to pass through the end of the vessel
“ just above its ordinary water line, and is there firmly affixed to
“ it. To the inner end of this short shaft another universal joint is
“ attached, which communicates directly with the bar or shaft to
“ which a circular motion is given by machinery, or the power of
“ men, or horses, or any of the prime movers which are generally
“ used for such purposes, and by which it will be seen that a
“ circular motion will also be given to the propeller while lying at
“ the outside of the vessel. The propeller with its external shaft
“ or bar are kept at their proper depth by means of guy or guide
“ ropes,” fixed by a shoulder and collar on the end of the shaft.
One of these guide ropes is attached to each side of the vessel, by
which it may be steered. “ The third is fixed to a projecting beam
“ in the nature of a bowsprit, or to the bowsprit itself, if the vessel
“ carries one, by which not only the depth of the propeller is
“ regulated in the water, but it may be raised quite out of the
“ water whenever required.”

2. Pipes laid on each side of a vessel, outside or in, underneath the water, have their "open ends at or near the stern on the two "opposite ends of the rudder," or pointing towards the stern, and air is forced through them into and against the water to propel the vessel.

[Printed, 3½*d*. No drawings. See Repertory of Arts, vol. 5 (*enlarged series*), p. 117-174; Rolls Chapel Reports, 8th Report, p. 112.]

In A.D. 1815, steam navigation was introduced into France (*a*).

A.D. 1816, March 14.—N° 3996.

DAWSON, James.—1. Paddles or screw propellers of elastic rods, covered with fan-like elastic pieces of canvas or similar material.

2. Masts of elastic material and sails united by springs to yards and masts.

[Printed, 6*d*. Drawings. See Rolls Chapel Reports, 8th Report, p. 113.]

A.D. 1816, November 1.—N° 4071.

SMYTHE, Benjamin.—1. At each side of a vessel are several cranks of the same size, connected with each other by horizontal connecting rods, upon which vertical vanes of a curved or scooped shape are placed, so as to act upon the water when the cranks are set in motion by machinery.

2. Watermills on a similar principle.

[Price, 6*d*. Drawings. See Repertory of Arts, vol. 33 (*second series*), p. 140; Rolls Chapel Reports, 7th Report, p. 117.]

A.D. 1816, December 10.—N° 4088.

WRIGHT, Richard.—1. "The vessel is constructed with one or "more channels entirely through her, fore and aft, open at the "bottom, with sides nearly parallel."

2. The steam passes from the boiler to a reservoir before entering the cylinder.

3. "Two cylinders, with two beams & cranks, at right angles "with each other, to prevent the necessity for a fly-wheel. In the "first steam cylinder, the steam acts by its own expansive "force without being condensed. In the second, or condensed "cylinder, it will be similar to other engines. As the passages of "the condensing cylinder will be closed part of the time the other

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(*a*) L'Univers Dictionnaire, &c. Paris, 1845, vol. 12, p. 807. M. Andriel navigated the steamer "L'Elise" to and from England in A.D. 1816, Journal des Maires, A.D. 1816, N° 35, Jouffroy's des Bateaux, &c. p. 67. She was built in England, ibid. p. 78.

" is discharging its steam, it is necessary to have a depôt to receive " the steam from the steam cylinder when the passages of the " steam cylinder are shut. The depôt may be a jacket to the " cylinders fixed in the boiler or contiguous; dimensions & shape " not material, but should prefer a content equal to one or more " cylinders' supply."

4. Feathering paddles.—Each float is hung by loops at its ends on the upper edge, from a horizontal rod on which it turns. One end of this rod is fixed in the rim of a single wheel, forming one side of the paddlewheel. Another similar wheel, of equal size, turns on a centre a little lower than the centre of the first wheel.

This second lower wheel is at the other side of the floats, so that they move between the two wheels.

From the second wheel there projects for each float a rod, which is fixed at one end in the rim of the wheel, and is parallel with the former rod, and at a distance from it equal to the vertical distance between the centres of the two wheels.

This second rod is connected with the former by a link, and it is also connected with that part of the surface of the float which it passes by a loop and pin.

The simultaneous motions of the two wheels cause the float to enter, move through, and leave the water with its broad surface always vertical.

[Printed, 6*d*. Drawings. See Rolls Chapel Reports, 8th Report, p. 117.]

A.D. 1817, October 10.—N° 4169.

OLDHAM, John.—" My invention and improvement consists in " the use and application of certain oars, which oscillate and move " with a peculiar progressively increasing and diminishing power, " in a pendulous manner, in the water, and may be placed either " under the vessel, or in any part of its two sides, or along the " whole of its sides."

Each oar swings fore and aft in a vertical plane, and by cogwheels connected with the beam of the oar the broad blade is caused to pass edgeways through the water during the return stroke, and to turn gradually during the other stroke, until its broad side acts on the water at the middle of the stroke, and its sharp edge is again turned to the water before it begins the return stroke.

[Printed, 9*d*. Drawings. See Partington on the Steam Engine, p. 231; Rolls Chapel Reports, 8th Report, p. 122. The patent is referred to in No. 4429, *post*., p. 71.]

A.D. 1817, November 25.—N° 4179.

NIEPCE, Joseph Claude.—Propelling a vessel by the pressure on the water of the gas and rarefied air produced by the inflammation of oil.

Essential oil resin or similar material is injected at intervals into a reservoir containing air, and is then inflamed. The gaseous material and heated products of inflammation pass through tubes with valves, which prevent their return, and enter a well, from which they expel the water with force along a tube, opening towards the stern of a vessel, and beneath the watermark. An elbow on the tube prevents the return of the water from without when the gaseous matter has completed the operation, and is allowed to escape by a chimney.

Water is then admitted to the well through side tubes with valves opening inwards from the sea. A new supply of air is meanwhile brought into the reservoir by the action of a spiral blower.

By using two receivers, the water of each may be expelled alternately, and the vessel be propelled evenly.

" My Invention consists principally in employing, as an agent, " expanded air, produced by combustible matter in a receiver, which " escapes through apertures closed with valves, & which will be " like the force of steam by pressing upon the surface of the water, " enclosed in a receiver, move a great number of machines, & " even repel the water with great force."

[Printed, 1*s*. 4*d*. Drawings. See Rolls Chapel Reports, 8th Report, p. 123.]

A.D. 1818, January 23.—N° 4209.

SCOTT, John.—1. In a longitudinal opening through the whole length of a barge several poles of different lengths are moved by wheels at one end, so as to press on the bottom of the river at the other end, which has an enlargement or forked piece to prevent it from penetrating too far into the ground.

2. Poles moved by wheels at the sides of a barge, or in an opening in the middle, thrust their ends against the water, and the ends being furnished with broad vanes thus propel the barge as oars. Each pole passes over a guide pin, which causes the motion of the wheel to lift the vane, and draw it through the air for the return stroke.

[Printed, 11*d*. Drawings. See Partington on the Steam Engine, p. 231 Rolls Chapel Reports, 8th Report, p. 122.]

In April, A.D. 1818, Dr. Thomson published a letter from T. L. Dick, giving an account of Scott of Ormiston's suggestions respecting a "spiral oar" or screw propeller (*a*).

In June, 1818, J. Boaz published an account of experiments in A.D. 1804, with a screw propeller (*b*).

In July, A.D. 1818, Colonel Beaufoy described a "spiral oar," or screw propeller, with two spiral rims fixed on arms which he had seen used thirty or forty years before in a model made in China (*c*).

A.D. 1818, October 31.—N° 4300.

DESFORGES, Nicholas.—1. "Beneath the bottom of the boat, " or other vessel which is to be propelled, I apply one or more " large wings or vanes, which are capable of moving horizontally " in the direction of the length of the vessel, by means of ropes or " chains, which are conducted upwards to the interior of the vessel."

Each vane opens as it is drawn against the water in one direction, and closes or lies flat for the return stroke.

2. When the plan is applied to vessels, without permitting the water to rise to its level in the opening at the bottom, through which the ropes work, that opening may be bent downwards, and again upwards, and the ropes carried round the bends by pullies. Into the lower elbow of the bend mercury is introduced in such quantity that the weight of the column will partially exclude the water.

[Printed, 7*d*. Drawings. See Repertory of Arts, vol. 36 (*second series*), p. 199. Rolls Chapel Reports, 8th Report, p. 126.]

In A.D. 1818, D. Napier established regular steam packets between Greenock and Belfast (*d*).

A.D. 1819, March 4.—N° 4345.

JEFFRAY, James.—1. Two parallel tubes, connected at one end, have their other ends open under the watermark. In one or both of these a piston is moved forwards and backwards to propel the vessel by drawing in and forcing out the water.

2. If the piston is made less than the diameter of the tube, and with valves in it opening one way, the reciprocating motion of the piston propels the vessel.

(*a*) Thomson's Annals of Philosophy, London, 1818, vol. 11, p. 438.
(*b*) *Ibid.* vol. 12, p. 75; see notice, p. 63, *ante.*
(*c*) *Ibid.* vol. 12, p. 246; see notice, p. 25, *ante.*
(*d*) Scott Russell on Steam and Steam Navigation, p. 247.

3. The tube may be contracted at the place where the water is ejected.

4. If the parts of the tubes in which the pistons work are raised above the water line, and the connecting tubes sufficiently elongated, the pistons will work dry, or in air, while the water is forced out as before.

5. Openings at the side of the tubes may be formed so as to admit the water more easily.

6. The tubes may be placed vertically, or at any angle.

7. The end of one tube may be made to turn on a joint, so that the water will be forced to one side or another of the keel to turn the vessel round, or to the bow or stern to stop the vessel, or to move it in various directions as required.

8. The plan may be adapted to pump the water from a vessel's hold, or to pump out the bad air.

[Printed, 7*d.* Drawings. See Repertory of Arts, vol. 37 (*second series*), p. 151; London Journal (*Newton's*), vol. 1, p. 99; Rolls Chapel Reports, 8th Report, p. 131.]

A.D. 1819, May 6.—N° 4367.

BOOTH, HENRY.—1. A square vertical frame carrying several hinged boards is moved backward and forwards in the water at the stern of a vessel. Each of the swinging boards opens and lies nearly horizontal as the frame moves for the return stroke.

The motion is given to this frame by a rod and piston fitting in a horizontal tube, the end of which being turned up to a vertical direction, allows another piston to be moved in it by an engine. Between the pistons there is water or other fluid in the tube, which communicates the motion of one piston to the other. By making the tube of different diameters in the parts where the pistons work, the motion of one may be slower than that of the other.

[Printed, 9*d.* Drawings. See Repertory of Arts, vol. 36 (*second series*), p. 129.; Rolls Chapel Reports, 8th Report, p. 134.]

A.D. 1819, May 8.—N° 4368.

MASON, JAMES.—(*A communication from a foreigner residing abroad.*)

1. A broad beam or oar is hinged at one end to a spindle turning vertically in gudgeons fixed in the side of a vessel. One end of a lever is connected with the beam, and the other end reachs

the deck of the vessel. The fulcrum of this lever is upon the upper end of the spindle on which the oar turns. By moving the lever back and forward and up and down, so as to lower or depress the oar, the vessel may be propelled as by the use of a common oar.

2. The lever and oar may be united, so that they form one bent lever, with one end in the water and the other over the deck of the vessel. This part of the invention, the patentee says, "I do not "claim as an original invention, having doubts respecting the same."

[Printed, 6*d*. Drawings. See Rolls Chapel Reports, 8th Report, p. 134.]

A.D. 1819, December 4.—N° 4416.

LAMBERT, Samuel.—1. A water-wheel, with feathering floats, which are always vertical. Each float hangs freely from a horizontal rod, one end of which is fixed to an arm of the wheel (when this wheel is single.) The lower part of the float is connected by a loop and pin to a circular rim, without arms, moving in a plane parallel to the wheel, and of the same size.

The centre of this circular rim is at the same distance below the axis of the wheel as the pin and loop on it is from the rod on which the float hangs. The circular rim being excentric with relation to the wheel, is kept in its proper position by a guide wheel outside of it at each end of its horizontal diameter, and which may either roll upon the rim or gear into it by proper teeth.

A spring pressing on the rim may be substituted for each guide wheel.

2. Feathering paddles.—When the floats are hung by pivots at each end, the rim is connected with the floats in the middle of each, which is cut in two to receive the rim, and to allow the guide wheels or springs to press on its outer side.

3. Troughs or racecourses, to direct the water in its entry to and exit from paddle-wheels and water-wheels.

[Printed, 10*d*. Drawings. See Repertory of Arts, vol. 41 (*second series*) p. 212; London Journal (*Newton's*), vol. 1, p. 341; Rolls Chapel Reports 7th Report, p. 122.]

In A.D. 1819, the "Savannah" steam-boat first crossed the Atlantic from New York to Liverpool (*a*).

(*a*) Woodcroft on Steam Navigation, p. 87.

A.D. 1820, January 15.—N° 4429.

OLDHAM, John.—" Certain further improvements on my former " improvements on my former Patent " (referring to Patent dated A.D. 1817, October 10.—N° 4169. See *ante*, p. 66.)

Feathering paddles.—Vanes are fixed on bars or spokes radiating from a shaft. Each bar is turned on its axis by cog-wheels on the shaft and the vessel's side, so that the vane is feathered gradually while it moves through the water, and presents its broad surface when in a vertical position. Two sets of vanes and bars on the same shaft are placed near each other, and feather in opposite directions.

[Printed, 6*d*. Drawings. See London Journal (*Newton's*), vol. 1. p. 252.]

A.D. 1820, April 19.—N° 4450.

LILLEY, George, and FRASER, James Bristow.—1. "If an " air-tight cistern, having a stop-cock at the lower part of any of " its sides, shall be in part filled with water, then upon the stop-" cock being opened the water will run out with greater or less " velocity or force, according to the diameter of the aperture and " the height of the body of water in the said cistern; and if into " the upper part of the said cistern so in part filled with water " a large quantity of air shall be forced by means of a condensing " air-pump, so as to increase the air pressure upon the water, then " upon the stop-cock being opened the water will rush out with " great force; and if, by the application of a forcing pump to the " said cistern, a quantity of water equal to what is permitted to " escape by the stop-cock be constantly pumped into the cistern, " the force of such a stream conducted from such a cistern placed " within a boat or vessel afloat by tubes, so as to act upon the " water under the vessel to the effect of propelling such vessel, " either head foremost or stern foremost, or in otherwise causing " her to alter her position, as may be required, the cistern being " supplied from the water in which the vessel floats."

The tubes are directed towards the bow and stern, and the water admitted so as to flow in the required direction by stop-cocks.

2. A similar arrangement has a pump with two pistons working in the same cylinder, and approaching and receding from each other. Each has valves opening in the same direction, so that a constant flow of water is maintained.

[Printed, 1*s*. 3*d*. Drawings. See London Journal (*Newton's*), vol. 2, p. 101.]

In April, A.D. 1820, R. Whytock published an account of the application of oars to steam-boats, and mentioned a screw propeller he had made in A.D. 1814 (*a*).

A.D. 1820, May 15.—N° 4462.

BARTON, JOHN.—1. The flue of a boiler returns twice through the water, and surrounds a tube holding water connected with that in the boiler.

2. A pump with a hollow piston rod, through which the water ascends.

3. A two-way cock, for feeding grease to the cylinder by regular supplies during the motion of the engine.

4. Two vanes, inclined to each other at an angle of about 60°, are fixed on an axis, and move air-tight in a cylinder through part of a revolution back and forwards.

A pipe admits water between the vanes from below, and a division from above bears on the axis and divides the cylinder into two water-tight compartments.

On each side of this division a valve opening from the cylinder allows the water to pass through a pipe to an air chamber which maintains a constant flow of water. Each vane has a valve opening outwards. The vanes must not oscillate so far as that either of them shall cross any one of the apertures communicating with the cylinder. The water will be admitted alternately above the vanes through their valves, and then forced through the upper valves into the air chamber.

5. The floats of a paddle-wheel are fixed on a hollow drum. "The drum must be air-tight and buoyant, and its advantage is " that it has a tendency of keeping the proper depth in the water, " so that the paddles act with the greatest effect."

[Printed, 6*d*. Drawings. See Repertory of Arts, vol. 40 (*second series*), p. 136; also vol. 45 (*second series*), p. 208; London Journal (*Newton's*), vol. 1, p. 421; Register of Arts and Sciences, vol. 2, p. 194 and 247; Engineers' and Mechanics' Encyclopedia, vol. 1, p. 511; Gill's Technical Repository, vol. 4, p. 122.]

A.D. 1820, June 3.—N° 4469.

TEISSIER, SIMEON.—1. " Applying the paddle or water-wheels " astern or in the rear of the vessel, instead of using them at

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(*a*) Edinburgh Philosophical Journal, vol. 2, p. 33. See also Mechanics' Magazine, vol. 31, p. 226.

" the sides or in other situations where they have been heretofore " applied."

2. The stern supports a framework carrying the paddle-wheels, and the sides may be boarded down to the water to protect the wheels.

3. That part of the vessel which carries the machinery may be a separate vessel, square or bluff at the bows, so as to be attached to the stern of several vessels in succession to propel them.

[Printed, 5*d*. Drawings. See London Journal (*Newton's*), vol. 1, p. 388.]

A.D. 1821, January 19.—Nº 4529.

PHILLIPS, Charles.—" Placing or fixing paddle or propelling " wheels, however constructed, in an horizontal position in boats " or vessels, and in the construction or application of moveable " paddles to the same."

The paddle-wheel, revolving horizontally on one side of the deck, has the floats or paddles mounted on its arms, so that they may turn round and fall towards the water when they arrive at the outside edge of the wheel, and be folded up when they pass again over the edge of the vessel, and so round the rest of the wheel inside the vessel.

The necessary motion of each float upon the arm as an axis is given by levers, cog-wheels, and inclined planes.

[Printed, 1*s*. 6*d*. Drawings. See London Journal (*Newton's*), vol. 2, p. 401.]

A.D. 1821, May 5.—Nº 4557.

REEDHEAD, John, and PASSEY, William.—A channel is made in each side of a vessel under water, and one or more pair of paddle-wheels, connected by cranks on their shafts or other gearing, revolve in the channels.

In bad weather gates or sluices may be used to close up the ends of the channels, and the water inside being then pumped out, the vessel will be navigable by sails.

[Printed, 5*d*. Drawings. See London Journal (*Newton's*), vol. 2, p. 405.]

A.D. 1821, July 23.—Nº 4572.

HEYTHUYSEN, Frederick Mighells, Van.—" My invention " consists in the treading round the axletree or spindle, into which " is fixed the road-wheels of a carriage or paddles of a boat, barge,

" or other small vessel," by fixing four or more arms crossways upon the axletree, so placed that the heels of the right or left feet may alternately tread them down and turn the axletree.

[Printed, 3*d*. No drawings. See Repertory of Arts, vol 42 (*second series*), p. 65; London Journal (*Newton's*), vol. 3, p. 124.]

A.D. 1821, December 20.—N° 4629.

GLADSTONE, John.—At each side of a vessel, or in an opening along the middle, two wheels are placed so as nearly to touch the water, and to carry upon them an endless chain, which is moved by the rotation of the wheels, one of them having studs on the periphery to catch into the chain. The lower part of the chain is allowed to droop in a curve, so as to go under the water, and floats fixed upon the chain are thus drawn through the water.

[Printed, 5*d*. Drawings. See Repertory of Arts, vol. 43 (*second series*), p. 70; London Journal (*Newton's*), vol. 4, p. 173.]

A.D. 1822, January 14.—N° 4639.

GORDON, David.—1. " Enclosing of the paddle-wheels in cases " where the water is only suffered to enter through an aperture " in front, and with the case or boarding extending underneath " the paddle-wheels as near as may be not to impede their motion " at the same time that the hindermost part of the paddle-wheel " case is left quite open."

2. Suspending tanks over the side of a vessel to keep her trimmed when sailing.

3. A grating round a vessel's side to break the waves.

4 A grating fixed on a floating piece to break the waves near a vessel, or fixed to a floating breakwater.

[Printed, 9*d*. No drawings. See Repertory of Arts, vol. 41 (*second series*), p. 262; London Journal (*Newton's*), vol. 4, p. 245; Register of Arts and Sciences, vol. 3, p. 33; Engineers' and Mechanics' Encyclopedia, vol. 2, p. 449.]

A.D. 1822, October 18.—N° 4712.

BINNS, Thomas, and BINNS, Jonas.—1. A rotary steam engine, consisting of a case with two flat sides, and the other sides curved to allow two " pallets " to move round steam-tight.

The pallets are vanes on two axles. One of the pallets revolves, and the other oscillates so as to direct the steam to each side of the first at proper times. The mode of opening the steam ports is not clearly explained.

2. Rotary pump on a similar plan.

3. "A metallic packing box to reduce friction by packing from the centre."

4. A boiler with two sets of tubes; one set being at right angles to the other, and furnished with "a lift or force pump, which "causes the water alternately to pass through the tubes, surrounded "by fire and flame." The bottom of the boiler is curved so as to force the smoke upon the fire and consume it.

5. "Flanches, between which a thin metalic plate is placed, "(which is called the safety plate) calculated to give way at a much "less pressure of steam than any other part of the boiler. The "steam escaping is conveyed by a tube into the chimney."

6. "Moveable fire bars to work on bearings; when disengaged "it drops into the ashpit, cleaning the same with greater facility." The bars are fixed in a frame, which turns on bearings at one end.

7. Feathering paddles. Each float turns on an axis, one end of which projects through the rim of the wheel, and terminates in a lever with a stud at the end. These studs travel in a grooved oval-shaped guide, so constructed as to turn the axis of each float in the proper manner, to cause it to enter, move in, and leave the water with its broad surface vertical.

8. "Another method of working paddles for propelling vessels, "the paddles of which are always in a vertical position, in conse-"quence of being loaded at the bottom edge proportionate to "the surface of the paddle." This may be worked with or without guides.

[Printed, 9*d*. Drawings. See London Journal (*Newton's*), vol. 6, p. 180.]

In A.D. 1822, the first steam vessel that carried the Admiralty pennant, the "Comet," was built at Deptford by Mr. Lang (*a*). The first that carried guns was the "Salamander," built ten years afterwards.

A.D. 1823, March 18.—N° 4763.

PRICE, Henry Habberly.—"The object of my said invention, "which I call my accelerator, is to give, at pleasure, to any steam "engine or engines, or other propellant force, greater power over "the paddle-wheels, or other rotary apparatus, than they now "possess."

(*a*) "Times" newspaper for April 27, 1857, p. 9, col. 5.

The engine shaft is capable of being detached from the paddle shaft, and the motion of the engine shaft may then be communicated through toothed wheels on a counter shaft, moved up to gear with a wheel on the engine shaft, and a wheel on the paddle-shaft. By regulating the size of these wheels the motion of the paddle shaft may be made in any required degree more or less rapid than that of the engine shaft. When the two motions are desired to be the same (as they usually are), the toothed wheels are put out of gear, and the two shafts connected by a pin.

[Printed, 5*d*. Drawings. See London Journal (*Newton's*), vol. 7, p. 68.]

A.D. 1823, April 12.—N° 4775.

HANCHETT, John Martin.—A pump with a solid piston has two pipes opening into its lower part, one with a valve opening inwards, and the other with a valve opening outwards.

The motion of the piston draws water through one pipe from the bow of the vessel, and forces it out through the other pipe at the stern, under the water-mark.

[Printed, 4*d*. No Drawings. See London Journal (*Newton's*), vol. 8, p. 17.]

In A.D. 1823, an account was published of a double boat at Nyphenburg, moved by hinged propellers on levers worked by a man's feet (*a*).

In the same year, J. Dawson described paddle vanes which feather by turning on the spokes as axes (*b*).

In the same year, W. Thorold described paddle vanes which keep vertical by swinging on their axes, as the lower half of each is made heavy (*c*).

A.D. 1824, February 19.—N° 4904.

ISAACS, Moses.—1. Spring spokes for wheels of land carriages, and a rod to prevent them from upsetting.

2. A swinging furnace is caused to heat two boilers while the steam from the cylinders is admitted to a third. The furnace is then turned to heat other two, while the steam from the cylinders

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(*a*) Magazine of Science, vol. 4, p. 169; Woodcroft's MS. collection (where there is a drawing).

(*b*) Repertory of Arts, vol. 43 (*second series*), p. 23.

(*c*) Repertory of Arts, vol. 43 (*second series*), p. 140.

is conducted to one of those first heated, but now allowed to cool. "Any fire or heat may be used by means of the moveable fires or "shades."

[Printed, 6*d.* Drawings. See Repertory of Arts, vol. 1 (*third series*), p. 125. London Journal, *Newton's*, vol. 10, p. 9. Register of Arts and Sciences, vol. 2, p. 371.]

In May, A.D. 1824, a revolving paddle scull or screw propeller was used by Waddell (*a*).

A.D. 1824, June 29.—N° 4981.

BUSK, William.—1. "Ichthyodic oar," a wedge between two planes under water is moved back and forwards, turning on an axis through its thick end, and so as to touch with its sides each plane alternately. Valves admit the water and close when the wedge forces the water against them. The oblique pressure of the sides of the wedge on the water propels the vessel.

2. A wedge is caused to move up and down with its thick end forward, and its edge horizontal in the water.

3. "Hydropetic propellent." Water pumped through tubes opening under the water.

4. Cones turned in the water, their points being turned towards the stern, and their axes horizontal.

[Printed, 1*s.* Drawings. See London Journal (*Newton's*), vol. 10, p. 243. The Patent is referred to in Specification N° 5002. See *post.*, p. 78.]

A.D. 1824, August 9.—N° 4998.

PERKINS, Jacob.—A screw propeller with four blades. Two of the blades are on one shaft and two on another shaft that works through the first, which is hollow for the purpose.

The surfaces of the blades are inclined at an angle from the line of the shaft of 45 degrees for the parts near the shaft, and 22½ degrees for the other extremities.

The blades on one shaft are inclined in an opposite direction, and revolve in an opposite direction from that of the blades on the other shaft. By means of four cogwheels and a screw for shifting the gear the revolutions of the shafts may be reversed so as to back the vessel. The whole apparatus is constructed so as to

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(*a*) The Scots Mechanics' Magazine, vol. 1, p. 348. See Woodcroft's MS. collection (where there is a drawing).

allow the sternmost end of the shafts to be raised or depressed while the others are still in gear with the cog-wheels.

[Printed, 9*d*. Drawings. See Repertory of Arts, vol. 1 (*third series*), p. 433; London Journal (*Newton's*), vol. 11, p. 124; Mechanics' Magazine, vol. 39, p. 210, vol. 40, p. 299.]

A.D. 1824, September 16.—N° 5002.

NEVILLE, JAMES, and BUSK, WILLIAM.—1. Planes, furnished with flaps or valves opening inwards, are hinged together at one edge, which is horizontal and pointed to the vessel's bow.

The planes being opened and closed like the covers of a book, expel the water from between them by a sort of bellows action, and thus propel the vessel.

2. Air is forced through a tube under water to propel a vessel.

The Specification refers to a former Patent, N° 4981. See *ante*, p. 77.

[Printed, 5*d*. Drawings. See Repertory of Arts, vol. 1 (*third series*), p. 195; London Journal (*Newton's*), vol. 10, p. 349.]

A.D. 1824, October 14.—N° 5021.

MAUDSLAY, HENRY, and FIELD JOSHUA.—"A method and "apparatus for continually changing the water used in boilers for "generating steam, particularly applicable to the boilers of steam "vessels making long voyages, by preventing the deposition of "salt or other substances contained in the water, at the same time "retaining the heat, saving fuel, and rendering the boilers more "lasting." A pump draws from the lowest part of the boiler as much salt as is left at each stroke by the steam used in the cylinder.

[Printed, 3*d*. See Partington on the Steam Engine, p. 236.]

In A.D. 1824, Marestier mentioned as having been proposed in America a screw propeller of a "helicoidal surface," in a channel under a vessel (*a*).

A.D. 1824, November 11.—N° 5035.

BUSK, WILLIAM.—1. An elastic plate fixed to an axis at one end is caused to vibrate back and forward in the water. The axis may be horizontal or vertical.

(*a*) Tredgold's Appendix D., p. 6.

2. A shaft projecting under water at the stern of a vessel has two arms, on each of which is an elastic plate set parallel with the shaft. The shaft is caused to revolve, and the action of the plates on the water propels the vessel.

3. An elastic plate is used as the lee-board of a vessel, and will bend to such a curve as will assist in propelling.

[Printed, 9*d*. Drawings. See London Journal (*Newton's*), vol. 12, p. 6.]

In A.D. 1824, John Swan tried double-bladed screws immersed at the sides of a vessel to propel her (*a*).

A.D. 1825, February 26.—N° 5104.

HILL, William Hopkins.—Feathering paddles. Each float of a paddlewheel revolves on horizontal pivots, and is connected to a forked piece at its back. The ends of the forked piece are conducted by links with the contiguous ends of the float on each side of the first float.

The drawing represents the action of this apparatus to be such as will produce a partial feathering of the floats, and cause them to pass through the water in a direction nearer the vertical than they would do if fixed on the arms of the wheel.

Directions are given for finding the requisite proportions of the several parts.

[Printed, 6*d*. Drawings. See Repertory of Arts, vol 2 (*third series*), p. 1; London Journal (*Newton's*) vol. 11, p. 349; Register of Arts and Sciences, vol. 4, p. 136.]

A.D. 1825, March 15.—N° 5126.

BROWN, Samuel.—A chain made fast at one end and lying in the water is passed round a wheel on board a vessel, and the wheel being turned by machinery the vessel is propelled, leaving the chain again on the bottom behind it.

[Printed, 8*d*. Drawings. See Repertory of Arts, vol. 2 (*third series*), p. 61; London Journal (*Newton's*), vol. 11, p. 194; Register of Arts and Sciences, vol. 3, p. 219.]

A.D. 1825, April 20.—N° 5153.

BROOMFIELD, John, and LUCKCOCK, Joseph.—1. Feathering paddles. A spur wheel on the paddle shaft turns another acting on a wheel fixed upon the horizontal axis of each float. By regu-

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(*a*) Mechanics' Register, 1824. Letter from G. Birkbeck Berwick Advertiser, 1851.

lating the number of teeth in the various wheels, the floats may be caused to point in any required direction during their revolution.

2. Altering the position of the spur-wheel on the paddle shaft " by " an endless screw, which serves as a regulator to the paddles, fixing " them in any angle of position; or which may be made a fixture " on the side of the vessel, determining the paddles to work at " a particular angle, which need not have any variation. The " relative position of the paddles with each other is determined in " this way, that one of them shall form a tangent to a circle on " the wheel, & the others shall all radiate towards the tangental " point. This construction of wheel may act entirely under water."

3. Instead of being fixed in wheels, the floats may be carried on beams, the ends of which have a rotary motion from cranks on vertical shafts, at a distance from each other equal to the length of the beams. Each float is turned by having upon its vertical spindle a bevel wheel, turned by another on a small shaft attached along the beam, and moved by cog-wheels; the whole being so arranged that all the floats on a beam, when it is moved against the water in one way, present their broadsides, and afterwards turn on their spindles, so as to pass through the water edgeways when the beam moves on the return stroke.

4. " To convert a canal boat into a sea vessel, we propose to " produce a false keel by bringing the two rows (of floats) into the " centre of the boat." The floats are turned so as to have their edges fore and aft, and nearly touching each other, and the whole so secured as to " form an artificial keel when the vessel is propelled by sails instead of machinery."

5. A rotary steam engine. A wheel revolves in a cylinder, into which pipes open for the admission and discharge of steam. The wheel has five indentations, within each of which works a rotating vane, with a section through its axis of an elliptical shape. The axle of the vane goes outside the case, and is geared by a toothed wheel to all the other axles. The rotating vanes adapt their positions to the forms of the indentations in the revolving wheel and the interior of the cylinder, and successively pass two steam-tight stops, which project into the cylinder so as to touch the wheel between every pair of vanes.

The operation of the machine is explained by a description of the drawings in the Specification.

[Printed, 11*d*. Drawings. See London Journal (*Newton's*), vol. 11, p. 79.]

A.D. 1825, July 26.—N° 5223.

REEDHEAD, John.—A paddle under the bottom of a vessel is moved by an engine, so as to act on the water with its surface across the line of the vessel's motion, and to fold down nearly horizontal for the return stroke. This is effected by cog-wheels, a rack, levers, and friction rollers, upon one of which an inclined plane travels.

[Printed, 6*d*. Drawings. See Repertory of Arts, vol. 2 (*third series*), p. 329; London Journal (*Newton's*), vol. 11, p. 302.]

In August, A.D. 1825, the "Enterprize" steamer started from London, and reached Calcutta in 113 days (*a*).

A.D. 1825, August 27.—N° 5247.

PARR, William.—1. Feathering paddles. Each float turns on a horizontal axis, dividing its surface unequally, the larger part below, so that when freely hung the edge of the float would be nearly vertical. The ends of the float project and rest against the arm or spoke, and are kept in this position by a sliding catch until the float has operated on the water, and is rising at an angle of about 45°, when the catch is released, and the float swings round. Another catch again fixes the float during part of its revolution about the shaft. An inclined plane is provided, to turn back the floats into their proper positions, if by a violent or sudden concussion one or more of them is thrown over to the opposite side of the arms.

2. The use of one of these wheels at the head of a vessel.

3. Paddle-floats, which may be moved outwards on the arms, to deepen their immersion as the vessel floats lighter during a voyage. The arms are in two pieces, which overlap at the joints, and allow the floats to be put further off from the centre.

[Printed, 7*d*. Drawings. See Repertory of Arts, vol. 4 (*third series*), p. 1; London Journal (*Newton's*), vol. 14, p. 70.]

A.D. 1825, September 8.—N° 5249.

MERCY, Charles.—A shaft across the vessel has at each end spokes dipping into the water, and carrying vanes which are moved in the water to and fro, with a reciprocating motion, by a lever. Each float turns on a horizontal pivot, and has "a rim two or

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(*a*) Minutes of Select Committee on Steam Navigation to India, 1834, quoted in the Edinburgh Review, vol. 60, No. 122, p. 445.

" more inches deep on the top & sides, to keep the water from " going off, except at the bottom of the paddles." The float swims upon the water at the back of the stroke, by which means the back water is avoided. On the spokes behind the paddles is fixed a ledge to prevent them from going back, by which means they hold the water when moved one way, and yield to it in the return stroke.

[Printed, 5*d*. Drawings. See Repertory of Arts, vol. 2 (*third series*), p. 263; London Journal (*Newton's*), vol. 11, p. 238.]

A.D. 1825, September 15.—N° 5253.

PALMER, George Holworthy.—" My invention consists in " the application of travelling flaps or propellers, applied either at " the sides or the bottom of a vessel."

" These propellers reciprocate parallel in a right line from head " to stern, & from stern to head of vessel, alternately changing " their direction, and varying the angle formed with the under side " of the vessel. When the propellers are travelling from head to " stern they are permitted to fall down, & form a right angle " with the sliding frames, & to collapse when going the contrary " way. The motion is regulated by chains, wheels, and friction " rollers."

[Printed, 6*d*. Drawings. See Repertory of Arts, vol. 2 (*third series*), p. 457; London Journal (*Newton's*), vol. 13, p. 335; Register of Arts and Sciences, vol. 1 (*new series*), p. 85.]

A.D. 1825, November 1.—N° 5274.

SEAWARD, John, and SEAWARD, Samuel.—1. " Employing " a wheel or wheels to turn or revolve upon the bottom of the " canal, river, or other shallow water or against the sides thereof, " & by that means propel or draw according as the wheel may be " placed, the floating vessel forwards, to which the said wheel or " wheels may be attached. The wheel or wheels above mentioned " we call propellers, & when necessary to guard against it or " them from sliding on the ground without proceeding forward, " we arm the periphery with projecting knobs or other contrivance, " well known to engineers, by which means the propeller will catch " firm hold of the ground, & propel the vessel with adequate " force, or the propeller may be formed of a boss on its axis with a " circular series of projecting arms or radii similar to a wheel " without its periphery. In general we employ only one propeller " for a boat or vessel, & place it in an opening or well through " the bottom of the boat or vessel."

The propeller is hung in a shaft either fixed or swinging with proper bearings. The arms may be made to slide in and out of hollow spokes freely.

2. A similar wheel applied to carriages.

[Printed, 7*d.* Drawings. See Repertory of Arts, vol. 7 (*third series*), p. 16; London Journal (*Newton's*), vol. 14, p. 240; Engineers' and Mechanics' Encyclopedia, vol. 2, p. 476.]

In A.D. 1825, a boat with a screw propeller in the bow was used on the Thames by S. Brown (*a*).

A.D. 1826, July 24.—N° 5393.

ROBINSON, William.—1. A paddle-wheel with floats rounded off at the outside corners is applied at the stem or stern of a vessel on a stage, which may be raised so as to lift the wheel from the water, and allow the vessel more easily to enter canal locks.

2. Sideboards hang on each side of the paddle-wheels or behind, to lessen the surge waves.

3. "Placing the steam engine & its boiler upon a moveable " platform, so as to be capable of moving all the engine along the " length of the boat to trim the same."

[Printed, 10*d.* Drawings. See London Journal (*Newton's*), vol. 14, p. 289.]

A.D. 1826, October 18.—N° 5419.

BUSK, William.—1. A board with two others on its sides, each of them projecting above and below, is applied to the end of a lever, the other end of which turns on a pin in the vessel's side. A vertical motion is given to the lever by a rod from a wheel above, and the board is thus caused to impinge on the water with its surface oblique to the horizon.

2. A cylinder encloses a paddle-wheel, and is open at both ends. The wheel is caused to revolve on an axis at the side of a vessel, and parallel with the keel; "the water in the cylinder will be thrown " by the centrifugal action with great force out of the cylinder."

[Printed, 6*d.* Drawings. See Repertory of Arts, vol. 4 (*third series*), p. 367; London Journal (*Newton's*), vol. 2 (*second series*), p. 21.]

A.D. 1826, October 18.—N° 5420.

VINEY, James, and POCOCK, George.—1. "The Patent is " obtained for an invention by which kites are made to act as " endyant sails for the purpose of navigating or drawing vessels."

(*a*) Tredgold's Appendix D., p. 6.

"The peculiarities of these kites are these: 1st. They are rendered "portable by folding up. 2nd. There is a moveable distender. "3rd. They have four lines by which their power is controlled "or their course directed. 4th. The kites may be attached at a "convenient distance one behind the other, by which plan an "indefinite power may be obtained."

2. A carriage moved by a kite, and with a platform "for the "carrying a poney."

[Printed, 5*d*. Drawings. See Repertory of Arts, vol. 4 (*third series*), p. 369 London Journal (*Newton's*), vol. 1 (*second series*), p. 29; Register of Arts and Sciences, vol. 1 (*second series*), p. 1; Engineers' and Mechanics' Encyclopedia, vol. 1, p. 322, also vol. 2, p. 478.]

A.D. 1826, November 18.—N° 5424.

WOODCROFT, BENNET.—Improvements in wheels and paddles for propelling boats and vessels.

[No Specification enrolled.]

A.D. 1826, December 20.—N° 5433.

HARSLEBEN, CHARLES.—1. Wells for fish in the bottom of a vessel with valves to be closed when necessary.

2. Feathering paddles.—Two paddle-wheels working horizontally under water are applied on either side of the vessel's keel, or if she be not flat-bottomed, then the wheels are in inclined positions. The floats are caused to feather for the return stroke, so as to cut edgeways through the water by cog-wheels, excentrics, rods, or inclined planes.

3. An axis with four leaves at right angles, each of them furnished with flaps like louvre boards, is caused to revolve in the water by the pressure of the stream against the leaves. A shield placed opposite that half of the apparatus in which the leaves are returning against the stream increases the effect. The machine is floated by a raft and casks to any point, and then sunk by admitting water to the casks, and secured in its place by moorings and by driving rods with screws into the ground. The revolution of the axis winds up ropes to haul or tow vessels in the stream.

[Printed, 8*d*. Drawings. See Repertory of Arts, vol. 6 (*third series*), p. 41; London Journal (*Newton's*), vol. 3 (*second series*), p. 204. The Patent is referred to in Specification, N° 5637, *post.*, p. 89.]

A.D. 1827, January 15.—N° 5448.

HALL, WILLIAM WILMOT.—(*Communicated from a foreigner residing abroad.*) "An engine for moving and propelling ships, "boats, carriages, mills, and machinery of every kind."

1. The gas and heated air in the flues of a boiler are forced into the boiler by a pump.

2. A coal hopper for a boiler furnace.

[Printed, 5*d*. Drawings. See Repertory of Arts, vol. 7 (*third series*), p. 67; London Journal (*Newton's*), vol. 2 (*second series*), p. 59.]

A.D. 1827, February 1.—N° 5455.

OLDHAM, JOHN.—Feathering paddles.

" These paddles, or float boards, are moved in such a manner, " that if lines were drawn radiating from the point or top of the " vertical diameter line of the wheel, that is, from the axis of the " upper paddles, through the centre of all the other paddle axles " these lines would all be in coincidence with the planes of the " float-boards or paddles."

Each float turns on a horizontal axis, and is connected by a short crank *e*, with an arm of a second wheel, revolving upon an excentric or circular crank keyed to a hollow shaft, which revolves on the paddle shaft, and terminates inside the inner arms of the paddle-wheel. "The distance between the centre of the circular " crank and its excentrical centre of motion upon the mainshaft " must be exactly equal to the length of the paddle-cranks *e*." The hollow shaft is connected by cog-wheels inside the vessel with the other shaft, so that the motions of both may be adjusted. By moving the hollow shaft only while the paddle-wheels are at rest, the floats in the water may be placed in a horizontal direction.

[Printed, 9*d*. Drawings. See London Journal (*Newton's*), vol. 14, p. 1.]

A.D. 1827, February 8.—N° 5461.

CONGREVE, WILLIAM.—Round a cylinder, free to move in water, is fixed a broad thick band of sponge. The water rises into this on one side by capillary attraction, and an endless chain compressing the band on the other side squeezes the water out. The difference in weight between the two sides causes the cylinder to rotate and to draw the vessel on, or move paddles to propel it. Glass or metal plates may be used to create the capillary action, and mercury may be used instead of water.

[Printed, 7*d*. Drawings. See Repertory of Arts, vol. 6 (*third series*), p. 33; London Journal (*Newton's*), vol. 2 (*second series*), p. 287 Mechanics' Magazine, vol. 7, pp. 151, 169 185 216 237 ,294.]

A.D. 1827, December 11.—N° 5580.

STEENSTRUP, Paul,—1. A tubular boiler, in which tubes cross the furnace and main flue, and expose their surfaces to the heat while the water circulates within them. A jacket round the funnel contains water kept hot to replenish the boiler. The tubes may be of a bent form to prevent injury from their expansion by heat.

2. A rotary steam engine, in which a revolving piston turns within a cylindrical case. A stop-piece between the pipes, admitting and discharging the steam, is moved in and out of the circular side of the cylinder by proper means, and when it removes to let the piston pass, it is received into a steam-tight case outside the cylinder. The engine is reversed by a second stop-piece and discharge pipe on the opposite side of the steam port.

3. Feathering paddles; each float turns on a horizontal axis, carrying a cog-wheel at the end. An endless chain passes round all the cog-wheels, and round another wheel on an axis, moved by a stationary cog-wheel on the vessel's side. The motion of the cog-wheels feathers the paddles.

4. Feathering paddles; in another construction, each float turning on a horizontal axis carries a cog-wheel at the end, which gears into a large toothed wheel revolving on the paddle shaft. Any motion therefore communicated to the large toothed wheel will be imparted by it to each of the axes and floats.

The large toothed wheel is moved by an endless chain, turned by a wheel gearing into another stationary on the vessel's side, and which chain turns the axis of one of the floats.

5. Applying such wheels obliquely or horizontally, or at the ends, sides, or under a vessel.

[Printed, 1*s.* 6*d.* Drawings. See Repertory of Arts, vol. 8 (*third series*), p. 349. London Journal (*Newton's*), vol. 2 (*second series*), p. 191; Mechanics' Magazine, vol. 10, p. 104; Register of Arts and Sciences, vol. 2 (*new series*), pp. 242, 269, 356, and 372; Engineers' and Mechanics' Encyclopedia, vol. 1, p. 215.]

A.D. 1827, December 15.—N° 5587.

SKENE, Andrew Motz.—Feathering paddles; each float turns on a horizontal axis passed through its surface, so as to cause the pressure of the water on each side of the axis to be nearly equal. The lower half of the float is of a semicircular form, the corners being rounded off, and it is heavily weighted or made of iron. From each side of the other half of the float the ends project so as to rest against the arm of the paddle-wheel, immediately behind and near its axis, and thus prevent it from leaving the vertical position when at its lowest point. In the other parts of its revolution the float gives way and swings free.

"If a wheel of greater width than two feet should be required, " I recommend that the same should be made by using three or " more rings, with the axis of the said two-feet paddles placed " alternately or midway between the first set."

The stopping of the paddles as they swing " may also be effected " by blocks or projections fixed in proper places, or by stop-screws, " so as to adjust the quantity of fall of the said paddles." The stops should be elastic to break the blows. Circular plates on each side of the paddle-wheel, concentric with the shaft, and revolving with the wheel, to confine the water. The plates last described may be filled in, so as to form a hollow cylinder.

[Printed, 8*d*. Drawings. See London Journal (*Newton's*), vol. 1 (*second series*), p. 297; Mechanics' Magazine, vol. 10, pp. 73, 92, 109, 118, 383, and 401; vol. 12, p. 327, and vol. 16, p. 331; Register of Arts and Sciences, vol. 2 (*new series*), pp. 195 and 297.]

A.D. 1827, December 18.—N° 5588.

STEVENS, John Lee.—Three strong arms are fixed on a horizontal shaft projecting from a vessel's side. They are at different points along the shaft, and are at right angles to it; the angular distances between each two of them being equal. Each arm has a frame swinging at the end upon journals, and on the frame are four paddle floats, parallel to each other, and of equal length.

The frame is connected by a rigid rod with a pin to another rod, the other end of which turns on a gudgeon fixed to the vessel's side. As the shaft revolves the four paddle floats of each frame will be feathered.

[Printed, 11*d*. Drawings. See Repertory of Arts, vol. 7 (*third series*), p. 71; London Journal (*Newton's*), vol. 1 (*second series*), p. 223; Mechanics' Magazine, vol. 9, p. 417, vol. 10, pp. 107, 163, 422; vol. 11, p. 249; and vol. 16, pp. 249 and 270; Register of Arts and Sciences, vol. 2 (*second series*), pp. 210 and 270.]

A.D. 1827, December 19.—N° 5591.

HOLLOND, Thomas Stanhope.—"An engine which derives its " power from the setting in motion of a lever movement similar to " *that which is used* in the instrument commonly called lazy tongs."

The application of the invention to land-carriages is described, but no mention is made of marine propulsion except in the title of the Patent, in which the invention is said to be "applicable to the "propelling of fixed machinery, as also floating bodies."

[Printed, 1*s*. 1*d*. Drawings. See Repertory of Arts, vol. 8 (*third series*), p. 17; London Journal (*Newton's*), vol. 1 (*second series*), p. 346; Mechanics' Magazine, vol. 10, p. 270; Register of Arts and Sciences, vol. 2 (*new series*), p. 258; Engineers' and Mechanics' Encyclopedia, vol. 2, p. 481.]

A.D. 1827, December 22.—N° 5594.

HALE, WILLIAM.—An axis, with one or more screw-threads upon it, revolves in a vertical cylinder, and raises water from the bottom of a vessel and forces it out through a pipe at the stern.

"I find that when the said revolving screw is twice as much in "height as it is in diameter it answers very well, and likewise that "two threads in the screw are better than one." The cylinder may be immersed wholly in the water. A piston may be used instead of a screw.

[Printed, 5*d*. Drawings. See Repertory of Arts, vol. 8 (*third series*), p. 22; London Journal (*Newton's*), vol. 2 (*second series*), p. 213; Register of Arts and Sciences, vol. 2 (*new series*), p. 246.]

In A.D. 1827, a screw propeller was tried in America (*a*).

A.D. 1828, February 5.—N° 5615.

NAIRN, WILLIAM.—"Making and suspending from rocking- "shafts or moveable joints two, four, or more levers or arms over "the sides or through an aperture or apertures of the vessel to be "propelled, and so connected with the engine or first mover as to have "a reciprocal motion, the same as or similar to that of a common "pendulum, either parallel or at a small angle to the line of the "vessel's motion." On the lower ends of these levers are hinged vanes, which open when pressed against the water and close towards each other during the return stroke. They may be applied instead of paddlewheels on a crank shaft.

[Printed, 4*d*. No drawings. See Repertory of Arts, vol. 7 (*third series*), p. 321; London Journal (*Newton's*), vol. 7 (*second series*), p. 19.]

A.D. 1828, March 20.—N° 5628.

GOUGH, NATHAN.—1. Relates to land carriages.

2. Each paddlewheel has a separate shaft with two cranks at right angles to each other. Each of the four cranks is turned by

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(*a*) Tredgold's Appendix D., p. 7.

a direct acting oscillating engine, the cylinder of which oscillates on arms nearly in its middle. The specification explains the construction of the valves of a three-way cock for reversing, and describes the hollow arms.

The two paddle shafts may be coupled by stops so as to work together.

[Printed, 1*s.* 11*d.* Drawings. See Repertory of Arts, vol. 8 (*third series*), p. 162; London Journal (*Newton's*), vol. 3 (*second series*), p. 237; Engineers' and Mechanics' Encyclopedia, vol. 2, p. 525,]

A.D. 1828, April 3.—N° 5637.

HARSLEBEN, Charles.—1. Feathering paddles. Each float is fixed on the end of a rod, as an arm of the wheel, turning in the rim and in a socket near the boss of the wheel. Near the latter end of the arm are small projections, which are acted upon by projections in a "metal wiper carriage," fixed to the vessel's side round the paddle-shaft. As the wheel revolves, the arms and floats are successively turned by the projections, so as to feather.

2. Springs are placed upon the projections to prevent concussion.

3. Cases, to protect the wheel, of light iron work, covered with bars or wirework. Bars, projecting near to the floats and axes, to clear off weeds.

4. For rowing boats or moving them by cranks. Pedals connected with the cranks are moved by the feet.

5. A rudder at the bows, directed by rigging from the bowsprit, is used to lessen the leeway when the vessel sails on a wind. "Keels of resistance" are set beside the usual keel at an angle on each side for a like purpose.

6. The Specification refers to Patent, A.D. 1826, December 20.—N° 5433. See *ante*, p. 84.

[Printed, 10*d.* Drawings. See Repertory of Arts, vol. 8 (*third series*), p. 83; London Journal (*Newton's*), vol. 5 (*second series*), p. 31.]

A.D. 1828, April 29.—N° 5644.

BOMPAS, Charles Carpenter.—Condensed gas or air contained in reservoirs is to be used for propulsion by applying it to the piston and cylinder of a steam engine.

The gas may be condensed to 100 atmospheres in stationary reservoirs, and transferred thence to those in the locomotive, It may be used expansively by employing two cylinders and pistons.

[Printed, 3*d.* No drawings. See London Journal (*Newton's*), vol. 2 (*second series*), p. 278; Register of Arts and Sciences, vol. 3 (*new series*), p. 23 Engineers and Mechanics' Encyclopedia, vol. 2, p. 502.]

A.D. 1828, July 5.—N° 5670.

ISAAC, John Johnston.—1. A paddle-wheel is worked at the stern of a vessel. The interior of the wheel is a water-tight drum.

Behind it is another wheel, the arms of which are small bars of iron ranged along the axis, near to each other, in rows. This wheel is caused to revolve in a direction opposite to that in which the first wheel turns; and below the second wheel is a thin, flat, horizontal flooring, which, with the turning of the wheel breaks the water, and lowers the waves caused by the first wheel.

Both wheels turn on gudgeons, which may be raised on either side if the vessel heels over, or if the wheels are to be lifted out of the water.

2. Metal cases, formed in compartments, are applied under water to buoy up the stern and other parts.

[Printed, 7*d.* Drawings. See Repertory of Arts, vol. 8 (*third series*), p. 474. London Journal (*Newton's*), vol. 8 (*second series*), p. 188.]

A.D. 1828, September 18.—N° 5707.

MELVILLE, John.—1. Rods with folding paddles at the ends, which collapse as they are drawn through the water for the return stroke, are worked horizontally at the sides of a vessel, or through stuffing boxes at the stern.

2. A horizontal cylinder-pump, across the bottom of a vessel, draws water through two tubes along the keel from the bow, and discharges it through tubes at the stern. An air chamber, in the latter tubes gives constancy to the flow of water.

[Printed, 6*d.* Drawings. See Repertory of Arts, vol. 10 (*third series*), p. 321; London Journal (*Newton's*), vol. 6 (*second series*), p. 320; Register of Arts and Sciences, vol. 3 (*new series*), pp. 241, 334.]

A.D. 1828, October 9.—N° 5714.

TIPPETT, Thomas.—1. For a steam engine, two cylinders and pistons are used, the small one one-fourth of the area of the other, and applied nearer the bearings of the beam.

The steam acts in the small cylinder by high pressure, and is discharged into the other cylinder at each stroke to work that expansively, and by condensing at low pressure.

2. Above a boiler *A* is a semi-cylindrical boiler *B*, connected with *A* by upright tubes. At the end of the flue through the centre of *A* is a third preparatory boiler *C*, where the water is first heated. The flame and heated air from the furnace passes through

the flue of *A*, strikes against the end of *C*, ascends to the bottom of *B*, passes along its whole length, descends by external flues along the sides of *A* near its front, passes beneath its bottom to the lower part of *C*, ascends to the top of *B*, and passes along it to the chimney.

3. Pistons working in cylinders placed horizontally along the keel of a vessel draw in an expel the water.

4. Rods with collapsing vanes or flat plates at the end of each are thrust backwards against the water to propel the vessel.

[Printed, 6*d*. Drawings. See Repertory of Arts, vol. 10 (*third series*), p. 79; London Journal (*Newton's*), vol. 9, (*second series*), p. 86; Register of Arts and Sciences, vol. 3 (*new series*), pp. 81, 114; Engineers' and Mechanics, Encyclopedia, vol. 1 p. 201.]

A.D. 1828, December 10.—N° 5730.

CUMMEROW, Charles.—1. A screw propeller or 'spiral' turns on an axis under water behind the stern of the vessel; the outer bearing is in a second sternpost, behind which is the rudder.

" To have an exact idea of the spiral one must figure to one's " self a pivot, for instance, of wrought iron, in which is fixed in " the shape of a vice (*a*) or wing of brass, wire of a quarter of an " inch thick, of an elevation of three feet from the centre of the " pivot, and which runs round it along a length of nine feet. One " must likewise figure to oneself, with this vice, the water as the " original vice, and with a force giving a central motion to the vice, " which applied to a boat will produce by the same motion the " translation of the boat."

The screw propeller when applied at a ship's stern has a shaft passing through a stuffing box in the foremost sternpost, and carrying a tooth-wheel turned by a steam engine, so as to cause the screw to revolve three times in a second.

2. When the screw propeller is applied to move two boats fastened together, the shaft carrying it is between the boats, and is moved to one side or the other by an arbor so as to steer them.

[Printed, 8*d*. Drawings. See London Journal (*Newton's*), vol. 8 (*second series*), p. 144; Repertory of Arts, vol. 14 (*enlarged series*), p. 242.]

(*a*) The Specification is probably translated imperfectly from the French, in which language the word "vis" means "screw." See MacGregor on the Language of Specifications, p. 59; also Bloxam *v.* Elsee, Carrington and Payne's Reports, vol. 1, p. 567. The figure referred to, at p. 2, line 7, of the Specification, appears to be omitted in the drawing.

A.D. 1828, December 15.—N° 5737.

BERNHARD, ANTON.—Feathering paddles. Each float turns on a horizontal axis, and has at one or both ends a small crank, which is moved by an arm of a wheel on an excentric. This excentric is loose on the paddle-shaft, but it may be clamped to the vessel's side by a lever.

By moving this lever to any required amount, and fixing it at that point, the position of the paddle-floats as they successively enter the water may be regulated by the position given to the excentric.

[Printed, 8*d*. Drawings. See Repertory of Arts, vol. 8 (*third series*), p. 644. London Journal (*Newton's*), vol. 3 (*second series*), p. 198: Mechanics' Magazine, vol. 14, p. 322; Tredgold on the Steam Engine, vol. 2, p. 117.]

A.D. 1828, December 18.—N° 5742.

STEAD, WILLIAM, and STEAD, JAMES.—Feathering paddles. The floats are in pairs, side by side, and each of them on an axis.

This axis turns at one end in the cross bar, uniting the two rims of the paddle-wheel, and at the other in a hole in a tube fixed to the bosses of the paddle-wheel, and revolving with it.

The end of the axis, after passing through this hole, is turned in a half-cranked form and rounded at the extremity, which works in a groove of a bent form on a tube concentric with the shaft and loose upon it, but fixed to the outside frame of the vessel at one end, which passes through that boss of the wheel farthest from the vessel's side.

The tube with grooves is thus stationary, and as the wheel revolves the end of the axis of each float moves along the groove, and is caused thereby, at certain intervals, to turn the axis a half turn round so as to feather the float.

[Printed, 6*d*. Drawings. See Repertory of Arts, vol. 8 (*third series*), p. 584. London Journal (*Newton's*), vol. 4 (*second series*), p. 280. Tredgold on the Steam Engine, vol. 2, p. 118.]

A.D. 1829, January 7.—N° 5749.

"ROBERTSON, ARCHIBALD.—1. Paddle-floats fixed obliquely " at an angle of from 40 to 70 degrees to the plane of the wheel's " motion."

The floats are to be parallel to each other. "They may proceed " in straight radiating lines from the centre at their inner sides,

" provided the external boundary of the said paddles be so twisted " as to bring them into the angular positions before named and " parallel to each other."

" In fixing and placing my aforesaid wheels for propelling, that " for the starboard side of the vessel should have the uppermost " vane or paddle with its inner edge next to the side of the vessel " to stand forward, and the other or outer edge to stand aft in the " required angle. The larboard wheel must correspond, but the " vanes or paddles must have their angles reversed, in order that " the two wheels must oppose each other." Each float reaches from the external circle on the wheel to an internal circle, from one-fourth to one-third of the diameter of the first circle.

2. Constructing diagonal or oblique paddles, so that the floats may be set to any angle by proper contrivances, and when the vessel is sailing or moved the paddle may act as leeboards, being placed with their edges fore and aft.

3. The paddle-shafts may be placed in an oblique direction at the quarters of the vessel.

4. Lifting the paddle-wheels by a chain and counterpoise weight.

[Printed, *4d.* No drawings. See London Journal (*Newton's*), vol. 7 (*second series*), p. 86; Register of Arts and Sciences, vol. 4 (*new series*), p. 3.]

A.D. 1829, January 7.—N° 5750.

WILLIAMS, Orlando Harris.—1. " I make the paddles of " metal or wood, or of any other suitable substance, by attaching " two plates, sheets, or boards together by means of bolts and " screws, the bolts passing through the stretchers or forked parts " of the paddle-arms. In order to increase the length of the " paddle one of the boards is made to shift, so that it may be " slidden upward or downward, and the surface elongated to any " required dimensions by passing the bolts through other holes, " and then screwing up the nuts tight." Metal floats are made of plates or sheets, bent or cast into a form slightly concave in the middle of their outer surfaces, and bevelled on their edges to a thinned feather or angular edge.

2. Feathering paddles. Each float is mounted on an arm projecting from the paddle-shaft, and turning on its axis perpendicular to that shaft at proper times, so as to enter the water and leave it with the edge of the float parallel to the plane of the vessel's motion, and to be turned half round so as to act with its broad

surface towards the water during the lower part of its stroke for about fifty-five degrees of its revolution. The arm carrying the float has projections acted on by tappets or inclined planes fixed in a frame at the vessel's side, so as to turn the arm half round at certain times. Another part of the arm has four sides or facets, one of which will rub against a flat circle fixed on the vessel's side, and thus keep the arm from turning round on its own axis, except at parts corresponding to the places where the projections are acted on by the tappets; and at those parts an indentation in the flat ring allows the square piece on the arm to turn and present another facet to the ring as the arm revolves.

[Printed, 1s. 1*d*. Drawings. See London Journal (*Newton's*), vol. 6 (*second series*), p. 241; Register of Arts and Sciences, vol. 4 (*new series*), p. 2; Rolls Chapel Reports, 7th Report, p. 129.]

A.D. 1829, January 7.—N° 5751.

NEALE, Francis.—1. A short crank projects over each side of the vessel from a shaft across, and moves a series of rods, some of which turn on pins fixed in the vessel's side. The system of rods works on the principle of the "lazy tongs," modified by the action of the levers with fixed bearings, and carries forward and backward in a curved path two sets of paddle floats which dip into the water, and in the return stroke pass through the air. Each float may be made to turn on pivots with shoulders which keep it vertical when passing one way, and allow it to turn back in going the other.

2. A modification of the plan when great strength is required.

[Printed, 7*d*. Drawings. See London Journal (*Newton's*), vol. 9 (*second series*), p. 126; Register of Arts and Sciences, vol. 4 (*new series*), p. 3.]

A.D. 1829, January 7.—N° 5752.

GRITTON, Septimus.—Feathering paddles. "The paddles are " moveable on bolts, pins, or axles, which are fixed between the two " inner sides of the wheel, in position parallel to the axle of the wheel, " so that on being put in motion they meet in their descent with " the resistance of the water, which forces them against their respec- " tive stop or stops, & thus each paddle becomes a propeller, & " continues such until it passes under the axis of the wheel, when, " in consequence of being moveable upon the aforesaid bolts, " pins, or axles, & duly poised, balanced, or regulated, each and " all the paddles in succession, after they pass under the axle,

" ascend edgeways, and continue more or less so until they respec-
" tively descend by the rotatory motion of the wheel."

This is all the description given.

[Printed, 3*d*. No drawings. See Rolls Chapel Report, 7th Report, p. 127.]

A.D. 1829, January 14.—N° 5758.

COCHRANE, William Erskine.—Feathering paddles. "Ap-
" plying the gravity or weight of a heavy connecting ring to cause
" all the several paddles which are disposed around the circum-
" ference of the paddle-wheel to preserve a vertical position during
" the rotation of the wheel." The floats turn on pivots, of which the outside one for each float is connected with the rim of the heavy connecting ring, which has no arms, and falls by its weight, so as to be always excentric to the paddle-shaft, and with each part of its circumference below the corresponding part of the circumference of the paddle-wheel. This connecting wheel may be placed on the middle of each float, holding a bar which unites at the bottom the two parts of the float cut down longitudinally by a slit of width sufficient to allow the connecting ring to play.

[Printed, 10*d*. Drawings. See London Journal (*Newton's*), vol. 9 (*second series*), p. 156.]

A.D. 1829, February 3.—N° 5765.

PUMPHREY, Julius.—1. A rotary steam engine, in which two axles carry revolving pistons. Each piston is of a section represented by a large semicircle working steam-tight in a cylinder, and a smaller semicircle on the other side of the axle. The larger semicircle on one axle works against the smaller one on the other. The valves and packing and pistons are described.

2. "Ribs and wales" are used on the outside of a cylinder or a flue in a boiler, and on the inside of a piston, to give strength.

3. "I use two spirals at the stern, one on each side of the
" rudder, in the direction of the ship's length, wholly under water,
" so that the rudder may act freely between the shafts of the spirals;
" and cutting the shafts off opposite the stern-posts or hangings
" of the rudder, I connect them again by Hooke's universal joint,
" & carry the spirals with a strong frame which is hung to turn
" in concert with the rudder. The spirals are to have a rotatory
" motion given them by a steam engine, the shafts of the spirals
" passing through a water-tight packing into the vessel. I form

"also one of the crossbars of the universal joint hollow for a "pin and nut to connect the spiral to the shaft, which being re- "moved I can, when the wind serves, take the spirals on board, "and sail without using the engine.

"Second. Where it is needful to protect the banks from the "effect of the spirals, I place the spirals as before, but employ a "common joint or splice instead of the universal joint. I also "cover the spirals with a case of sheet or plate iron or copper, or "other material, in which they can revolve freely, to protect them "from injury, and confine the surge from destroying the banks. "The case and spirals must be supported with a frame, which "must all be made to take off where room is wanted to turn the "boat round, or occasionally to pass a lock.

"Third. Where I have to pass locks frequently I use one or "two spirals in a waterproof case inside the boat in the line of its "length, and introduce the water by large openings at the sides of "the boat into the case. The water is thrown out at the stern of "the boat by the revolution of the spirals. I hang the rudder in "the centre of the opening at the stern; it may be round, square, "or almost any regular figure, but I hang it at or near its vertical "centre, and give it, both front and back, a sharp cutting edge."

[Printed, 10*d.* Drawings. See London Journal (*Newton's*), vol. 4 (*second series*), p. 328.

A.D. 1829, May 19.—N° 5789.

DUTTON, JAMES (junior).—Hollow vessels are forced against the water at a considerable angle with the horizon, and propel the vessel by their impact. Each vessel is moved out by a piston in a steam cylinder, and is returned to its place by its buoyancy.

[Printed, 6*d.* Drawings. See Repertory of Arts, vol. 11 (*third series*), p. 135; London Journal (*Newton's*), vol. 5 (*second series*), p. 75; Register of Arts and Sciences, vol. 4 (*new series*), p. 136; Rolls Chapel Reports, 7th Report, p. 130.]

A.D. 1829, May 26.—N° 5793.

POOL, WILLIAM.—Feathering paddles. Each float turns on a horizontal axis, and is moved by a crank at one end. The pin at the extremity of the crank travels in a circular groove between two concentric rings, the outer ring being of the same size as the paddle-wheel, and both of them fixed to the vessel's side.

The centre of these rings is on the same level as that of the paddle-shaft, but not at the same point. "Their excentricity is " therefore only lateral, & its quantity may in general be equal " to about one half of the length of the crank arms (on the axles " of the floats), but should in nowise be equal to their entire " length." The motion of the floats is such, that " any two floats " or paddles which may be opposite to each other will form angles " of about 45 degrees with the horizon when they are in the posi-" tion of the horizontal diameter of the wheel, & those angles will " be in opposite directions to each other, or, in other words, the " upper edges of both the said paddles will incline inwards, in " a direction pointing nearly to the top of the wheel, & the de-" scending paddle will not become erect till it has proceeded about " 45 degrees below the horizontal diameter, & will continue in " very nearly that position throughout the whole lower quadrant."

[Printed, 6*d*. Drawings. See London Journal (*Newton's*), vol. 4 (*second series*), p. 33; Mechanics' Magazine, vol. 12, p. 339; Register of Arts and Sciences, vol. 4 (*new series*), p. 186; Tredgold on the Steam Engine, vol. 2, appendix, p. 118.]

A.D. 1829, June 1.—N° 5797.

MANN, William.—1. "The condensing pumps used in con-" densing the air I make of different capacities, according to the " density of the fluid to be compressed; those used to compress " the higher densities being proportionally smaller than those pre-" viously employed to compress it at the first or lower densities." The pumps are connected, so that the air in each, on one side of the piston, is at the density of the air already condensed by the preceding pump.

2. Condensed air applied to convey a means of power along tubes, or to projectiles, or to land carriages.

3. Machines for propelling vessels are to be moved by air carried in a compressed state in reservoirs filled by stationary engines.

[Printed, 6*d*. No drawings. See Repertory of Arts, vol. 9 (*third series*), p. 93; London Journal (*Newton's*), vol. 8 (*second series*), p 317; Register of Arts and Sciences, vol. 4 (*new series*), p. 164, also vol.5, p. 90; Engineers' and Mechanics' Encyclopedia, vol. 2, p. 502.]

A.D. 1829, July 2.—N° 5805.

GALLOWAY, Elijah.—1. A steam engine, in which a disc oscillates, through nearly three quarters of a revolution, in a cylinder, and communicates rotary motion to a crank by a connecting rod jointed to the axis carrying the disc by levers.

[By a Disclaimer, enrolled December 18, A.D. 1838, the improvement in steam engines is disclaimed.]

2. Feathering paddles. Each float turns on a horizontal axle, and is rigidly connected with an arm or rod projecting towards the paddle-shaft at an angle with the surface of the float.

This arm is moved by a connecting rod, jointed to it at one end, and turning at the other end (except in the case of one of the arms) on a pin, in a vertical circular plate, working loosely on a crank fixed on the framing of the paddle-box outside the end bearing of the paddle-shaft. The arm, which does not work on a pin (as already mentioned), is fixed to the circular plate.

The plate thus turns round its centre on the stationary crank, and the axles of the floats are therefore at different distances from the crank, so that the connecting rods turn the floats, as it may be desired to place them, at various parts of their revolution about the paddle-shaft.

[In a Memorandum of Alteration, enrolled December 17, A.D. 1838, directions are given to enable the rods and levers and the excentricity of the crank to be adjusted.]

[Printed, 1*s*. 4*d*. Drawings. See Repertory of Arts, vol. 4 (*new series*), pp. 275, 342, 357, and 359; vol. 5 (*new series*), p. 28; vol. 7 (*new series*), pp. 182, 209, 273, and 322; vol. 8 (*new series*), p. 45; vol. 11 (*new series*), p. 182; vol. 13 (*new series*), pp. 220, 279, and 332, and vol. 2 (*enlarged series*), 181, for extension; London Journal (*Newton's*), vol. 6 (*second series*), p. 193, and vol. 21 (*conjoined series*), p. 477, for disclaimer; Mechanics' Magazine, vol. 23, pp. 318 and 322; also vol. 38, p. 452; Register of Arts and Sciences, vol. 4 (*new series*), p. 193; Webster's Reports, vol. 1, pp. 166, 167, 170, 187, and 724; Webster's Patent Law, pp. 49, 50, 51, 66, 77, 81, and 117; also p. 136, Cases 113 and 113*, and p. 137, Case 126; Carpmael's Reports on Patent Cases, vol. 2, pp. 1, 37, 96, 105, and 107; Meeson and Welsby's Reports, vol. 2, p. 544; Jurist, vol. 1, p. 527; New Term Reports, Part 12; Tredgold on the Steam Engine, vol. 1, appendix, p. 41; vol. 2, appendix, p. 118; Captain Wilson's Evidence before the Select Committee on Steam Navigation to India, Edinburgh Review, vol. 60, No. 122, p. 475; MacGregor's Language of Specifications, p. 36, and p. 63.]

A.D. 1829, July 2.—N° 5806.

PERKINS, Jacob.—1. The floats of paddle-wheels are fixed at an angle of 45 degrees to the plane of their motion.

The paddle-shafts work horizontally at an angle of 45 degrees to the line of the ship's length, and are, therefore, perpendicular to each other.

The effect of this arrangement is to cause each float, when at the lowest point of its revolution, to have its surface perpendicular to the direction of the vessel's length (as the float of an ordinary paddle-wheel would be). When the float is at the highest part of its revolution its outside edge will be parallel to the direction of the vessel's length.

2. A paddle-wheel with oblique floats, placed in the stern of a vessel, with its paddle-shaft horizontal, and inclined at an angle of 45 degrees to the line of the vessel's length.

[Printed, 6*d*. Drawings. See London Journal (*Newton's*), vol. 7 (*second series*), p. 276; Mechanics' Magazine, vol. 14, p. 305; Register of Arts and Sciences, vol. 4 (*new series*), p. 194.]

A.D. 1829, July 4.—N° 5808.

CRABTREE, Robert.—" A machine or apparatus, which is put " in motion by means of a pendulum or lever acting upon two " lever chains or system of levers, commonly called 'lazy tongs,' " which, by their alternate expansive and contractive motion in " propelling weights to and upon a main beam balance or lever, act " by means of crank rods upon the cranks of paddle-wheels in " relation to vessels, and upon common wheels in relation to " carriages; and also, by means of propellers in relation both to " vessels and carriages."

[Printed, 9*d*. Drawings. See London Journal (*Newton's*), vol. 6 (*second series*), p. 246; Engineers' and Mechanics' Encyclopedia, vol. 2, p. 523; Rolls Chapel Reports, 7th Report, p. 130.]

A.D. 1829, September 30.—N° 5853.

MOORE, John.—A lever, moved up and down, works a framework vibrating on horizontal axes, connected with clamps, or gripes and springs, which lay hold on the peripheries of two wheels on a horizontal axis, and turn them round. Paddle-floats may be added to them.

2. A mode of directing land carriages.

3. " The application of a valve, by which means atmospheric air " may be admitted to assist in condensing the steam of the steam " engine."

4. Combining a casing or jacket with a condensing cylinder or pump.

[Printed, 10*d*. Drawings. See London Journal (*Newton's*), vol. 9 (*second series*), p. 57; Engineers and Mechanics' Encyclopedia, vol. 2, p. 523.]

A.D. 1829, October 15.—N° 5857.

CHURCH, William.—1. The peculiar construction and arrangement of several of the parts and appendages necessary to the constructing and working of a steam engine. They are described at some length.

2, " I employ two wheels, each having a series of bent paddles, " revolving on a common axle, but in opposite directions." The common axle is parallel to the keel of the vessel, and the apparatus is like a screw propeller with two sets of vanes revolving in opposite directions.

3. Boilers, furnaces, fuel hoppers, feed pipes, and safety valves.

[Printed, 1*s.* 11*d.* Drawings. See London Journal (*Newton's*), vol. 7 (*second series*), p. 207; Register of Arts and Sciences, vol. 5 (*new series*), p. 5; Rolls Chapel Reports, 7th Report, p. 131.]

A.D. 1830, January 12.—N° 5879.

HALE, William.—" A vertical or horizontal air-tight paddle-box, kept constantly supplied with water, & the sides of which, " by means of a paddle-wheel or propeller, turning in the said water, " are forcibly acted upon at all points, except at an aperture where " the water escapes."

" The propeller, to give motion to the water in this machine, is " composed of one or more curved paddles, & set at an angle to " prevent any vacuum behind them, revolving at the extremity of " spokes or arms, round on an axis, nearly in the middle of the " machine."

The water is admitted at one or both sides, and in the interior of the machine receives a rotatory motion from the revolving paddles, which causes it to press against the circumference of the case, and to rush out through the aperture by which propulsion is effected.

[Printed, 6*d.* Drawings. See Repertory of Arts, vol. 10 (*third series,*) p. 97 London Journal (*Newton's*), vol. 2 (*conjoined series*), p. 22; Register Arts and Sciences, vol. 9 (*new series*), p. 67.]

A.D. 1830, April 14.—N° 5927.

SUMMERS, William Alltoft, and OGLE, Nathaniel.—A boiler, "applicable to propelling vessels." "Placing an inner "*flue or tube for the escape* of the heated air or gas arising from

" the fire inside a larger tube or vessel in an upright, or perpen-
" dicular or vertical position, the said inner flue or tube running
" through the inside of the larger tube or vessel, and out at the
" top, the larger tube or vessel being also placed in an upright or
" perpendicular or vertical position." Several of these tubes with tubular flues in each are combined to form a boiler, and placed over a furnace.

[Printed, 9*d*. Drawings. See Repertory of Arts, vol. 12 (*third series*), p. 65. London Journal (*Newton's*), vol. 8 (*second series*), p. 85; Register of Arts and Sciences, vol. 5 (*new series*), p. 193; Engineers' and Mechanics' Encyclopedia, vol. 1, p. 205, and vol. 2, p. 527.]

A.D. 1830, July 19.—N° 5957.

BULKELEY, THOMAS.—The rim of a paddle-wheel is made in parts with scarf joints bolted together. The nave is in two circular parts, one of which has grooves to receive the arms, and the other plate is bolted on.

The floats are fixed in holes on the rim. A capstan moves the paddle-wheels by an endless rope, and ratchet wheels with pauls prevent the wheels from turning the wrong way when struck by the waves. By throwing a cog-wheel out of gear the paddle-whee connected with it may be stopped while the other is in motion.

[Printed, 10*d*. Drawings. See London Journal (*Newton's*), vol. 3 (*conjoined series*), p. 245; Register of Arts and Sciences, vol. 5 (*new series*), p. 291.]

A.D. 1830, August 5.—N° 5965.

RUTHVEN, JOHN.—1. Paddle-floats, of a curvilinear surface, so placed that a convex part may strike the water first. They may also be made in the form of a barrel air-tight.

2. A rod working horizontally moves two cogged wheels by vertical levers and palls. These wheels gear into a toothed wheel, to work the paddle-shaft by the alternate motion of the rod, which causes the levers to oscillate.

3. A lever moving vertically raises and depresses the piston of a pump by a curved connecting piece, which bears on pins near the end of the piston rod in such a manner as to allow them a lateral motion, and so preserve the vertical motion of the piston rod.

[Printed, 8*d*. Drawings. See London Journal (*Newton's*), vol. 3 (*conjoined series*), p. 241; Register of Arts and Sciences, vol. 5 (*new series*), p. 294.]

A.D. 1830, November 4.—N° 6027.

BRAMLEY, Thomas, and PARKER, Robert.—1. "The "application of the strength of horses or other quadruped animals "to tread upon steps projecting out of two rollers, which are "mounted on two parallel horizontal axes in the manner hereinbefore described, whereby the said rollers are turned round "forcibly by the weight of the horse or other quadruped animal, "the same being harnessed to a fixed frame in the manner hereinbefore described, so as to act by his weight, and by his muscular "force of pulling at the same time." The machinery when applied to propel vessels on water turns a shaft with paddle-wheels.

2. Various land carriages moved by levers worked by the feet and hands of a man.

3. Improvements in axletrees and wheels for land carriages.

[Printed, 2*s.* 1*d.* Drawings. See London Journal (*Newton's*), vol. 8 (*conjoined series*), p. 363; Mechanics' Magazine, vol. 15, p. 349; Register of Arts and Sciences, vol. 6 (*new series*), p. 97; Engineers' and Mechanics' Encyclopedia, vol. 2, p. 536.]

A.D. 1830, November 29.—N° 6041.

CHURCH, William.—"My improvements in apparatus applicable to propelling boats & driving machinery by the agency "of steam, parts of which improvements are also applicable to the "purposes of evaporation, consist in the construction of furnaces "for heating boilers, whereby a more perfect combustion of fuel is "obtained in the apparatus employed in supplying boilers with "water, in the construction of boilers, in the construction of steam "engines properly so called, in the application of apparatus for "recovering the heat that has been employed in generating steam "or vapour, and thus economizing fuel in all purposes of evaporation."

1. The furnace is supplied with fuel from above, and an "annular blast" of air causes the heated products to descend through the burning fuel to a flue, which traverses the boiler several times by annular passages, between every two of which the water is contained and heated.

2. The water is fed by a piston turning in a cylinder. A hole in the piston is thus brought alternately opposite the opening of the feed pipe, which fills the hole with water, and opposite an aperture leading into the boiler, through which the water descends by its gravity, the upper part of the hole in the piston being at the same

time under a pipe from the steam space in the boiler. The water contained in the hole in the piston is thus at every motion of the piston transferred to the boiler until the level of the water in the boiler rises to a certain point.

3. The air to be used in the "annular blast" for operating on the fuel is forced along tubes enclosing other tubes, in which is the eduction steam, so that this steam is condensed, while the air for the blast is heated. A glass water gauge is kept clean inside by a piston moved in it.

4. The steam engine has a cylinder oscillating on hollow journals at its bottom, and the piston rod is connected directly to the crank of a fly-wheel. The head of the piston rod moves in guides, fixed to the cylinder, in which also the brasses of the crank play loosely. The steam enters by one of the hollow arms or journals, and passes up the side of the cylinder to the steam box, in which are slide valves. The eduction steam passes to a jacket outside the cylinder and away through the other hollow journal.

5. " In order to regulate the speed of the engine, I cause the " throttle valve to be shut at an earlier or later period of the stroke " as the case may require." This is done by tappets on the surface of a wheel, and the distance between which may be adjusted so as to work at proper intervals the rod moving the valve.

6. A mode of employing spiral and annular passages for distillation.

[Printed, 3*s.* 4*d.* Drawings. See London Journal (*Newton's*), vol. 8 (*second series*), p. 1; Register of Arts and Sciences, vol. 6 (*new series*), p. 106; Rolls Chapel Reports, 7th Report, p. 134.]

A.D. 1830, December 13.—N° 6052.

WITTY, Richard.—A carriage or a boat is propelled by wheels or paddles on a shaft with a three-throw crank worked by three steam cylinders, in one of which the steam may act either above or below the piston, as may be desired (for reversing the motion.)

In the two other cylinders the ends are open, and are turned in the opposite direction from that in which the boat or vessel is propelled.

[Printed, 5*d.* Drawings. See Repertory of Arts, vol. 12 (*third series*), p. 75; London Journal (*Newton's*), vol. 8 (*second series*), p. 248; Mechanics' Magazine, vol. 22, p. 345; Register of Arts and Sciences, vol. 6 (*new series*), p. 132.]

MARINE PROPULSION.

(EXCLUDING SAILS.)

(PART II.)

FROM investigations carried on since the publication of Part I. of this work, additional facts have been ascertained respecting one or two points which it seems advisable to notice. (*a*)

(1) BLASCO DE GARAY (*see ante* Part I., p. 6) does not appear to have invented the steam boat.

(*a*) More particular information on these subjects will be found in the following letter addressed to the Superintendent of Specifications at the Great Seal Patent Office:—

" SIR,

" ON the 23rd of September last I visited the town of Simancas, near Valladolid, in Spain, with Captain John Ussher, to inspect some letters of Blasco de Garay, which are there preserved among the National Archives.

" Having obtained the requisite Royal permission, I was allowed after much difficulty to read (but not to copy) two letters, signed by Blasco de Garay, written clearly in Spanish, and well preserved. One of these was addressed from Malaga, the other from Barcelona, and both were dated A.D. 1543. They describe two separate experiments with different vessels, both of them moved by paddle-wheels turned by men.

" One vessel was stated to be of 200 (Spanish) tons burden, propelled by a paddle-wheel on each side worked by 25 men. The other vessel was moved in a similar manner by 40 men (in all). The speed attained is mentioned in the text, and is stated in a side-note (written by a different hand) to have been one league (about 3½ English miles) per hour. Various calculations as to the tonnage, the motive power, the cost, and other matters are contained in the letters, and it is said that a vessel thus moved was found to steer well, but could be propelled more easily for a long time by oars. Also that, like other inventions, this would probably be improved by the experience of further trials. We read the letters carefully through, and neither of them contained any mention whatever of the use of steam, or any expression to indicate that this was contemplated.

" The officer left in charge of the documents, Don Manuel Garcia, said that he did not know of any other letters of Blasco de Garay, or of any other authentic papers relating to his experiments; that he believed most certainly Blasco de Garay did not invent or suggest the use of steam for propulsion, and that the assertion he had done so was 'un mensonge historique.'

" On October 15th, and following days, I made diligent inquiries at Barcelona, respecting Blasco de Garay, and after writing a letter to the newspapers inviting information on the subject (published in the 'Diario de Barcelona,' 19 October 1857), Signor Michel Mayor undertook to satisfy my inquiries. At the Archivas de Arragon the Director said no trace of any document relating to Blasco de Garay was to be found there, and that the MSS. in that library are arranged only by order of reigns, and not by dates. With Don Gregorio Fidel Clares, I inspected the catalogues of the Bibliotheca Publica and of the Bibliotheca Publica Episcopal, without any better result, and the keepers of these libraries

(2) The **Marquis de Jouffroy** (*see ante*, Part I., p. 33) is related, on good authority, to have caused a steam vessel to move in A.D. 1783.

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declared they knew nothing of any other letter of Blasco de Garay. One of these officers said he believed that men only had been used to move the vessels, and the Government Inspector of Mines assured me that he was of the same opinion.

" A Spanish engineer mentioned that some of the actual steam-engine machinery used in the vessels was still to be seen at the School of Artillery, but after diligent inquiry there, I could find no trace of any kind of relics.

" It has been reported to me since this investigation, through Col. Stopford of Madrid, that there is said to be yet another letter of Blasco de Garay, in which he alludes to the steam-boat, and that this document is kept secret at Madrid, which would not probably be the case if by its means the claim of a Spaniard to the invention of the steam-boat could be substantiated.

" At Paris on October 30, in company with M. Frederick Tolhausen, I was allowed by M. Pilet, the proprietor of the 'Journal des Maires' to inspect a copy of N° 35 (A.D. 1816) of that paper, alluded to at p. 33 of Part I. of the 'Abridgment of Specifications, relating to Marine Propulsion.'

" The engraving in this paper is the same as that attached to his description of the invention on application for his Patent by the Marquis de Jouffroy, but one of the figures is omitted in the plate inserted in the official copy of the Patent.

" At the Library in the 'Conservatoire des Arts et Métiers,' we inspected the following documents relating to the Patent of the Marquis de Jouffroy:—

" 1. His petition for the exclusive use of steam-boats for fifteen years, dated March 27, 1816. In this the Marquis says he had made experiments in A.D. 1783.

" 2. Description of his invention by the Marquis de Jouffroy for the Consultative Committee.—This claims the invention of the steamboat, and mentions that he sends with it a drawing and plans. The paper is marked in pencil (probably by the Committee), obliterating those sentences which claim the invention of the steam-boat generally, and making one or two verbal alterations. The official printed copy of the Patent appears to have been taken from this paper in its altered form.

" 3. Report of the Committee, dated April 11 (and another on the Patent for improvements, dated 28th May).—The Committee recommend the Patent to be granted, but they remark, that the Marquis could not claim the invention of the steam-boat generally in his Patent, even if he were the first inventor, seeing he had published the invention beforehand according to his own account. A side-note on this paper, dated April 17, and signed by the Marquis de Jouffroy, says that he claims his Patent, notwithstanding the remarks of the Committee. The other Report on his improvements says that the invention was Rumsey's.

" 4. A pamphlet written by the Marquis, and printed by Le Normant, Paris, February 1816. (The edition of this pamphlet, referred to in p. 33, Note (*a*), of Abridgment, Part I., is dated 1841, and is otherwise different from the earlier edition).

" 5. A steel engraving, representing the vessel used by the Marquis, and containing four figures. This is the earliest drawing of the vessel, and of the same impression as that in the Journal des Maires. A copy of this drawing is in the Great Seal Patent Office Library in London.

" 6. The Patent dated 27th September, 1815, but corrected to 27th March, 1816. and granted 23rd April, 1816.

" 7. A Notarial copy of the official note made by two Notaries Public at Lyons (with a stamp), dated 19th August, 1783, declaring that on the 15th of July, 1783, M. Claude-François Dorothée, Comte de Jouffroy d'Abbans, in the presence of nine persons (named therein, as certifying thereto), had caused a vessel 130 feet long to move by the power of a steam-engine during a quarter of an hour against the current of the river Saône. A copy of this document is in the pamphlet 'Des Bateaux à Vapeur,' in the Great Seal Patent Office Library.

" From these inquiries in Spain and France it appears,—1. That if Blasco de Garay used a steam-engine to propel a vessel, the evidence of the fact is not afforded by his two letters at Simancas, and is not produced, if it is known there or at Barcelona, by the public officers and others interested in supporting

(3) A small water insect moves as if propelled by a paddle and screw combined (*a*).

A.D. 1818, May 4.—N° 4253.

(The abridgment of this Specification was omitted from Part I.)

COCHRANE, Sir Thomas, and GALLOWAY, Alexander.

1. Smoke consuming.

2. Paddle-wheels. The smoke and products of combustion from the furnace are forced by a pump into the closed paddle-box of a paddle-wheel deeply submerged, so as partially to exclude the water and diminish the back-water.

(This patent is referred to in that of Stevens, in A.D. 1847, N° 11,746; see *post*, p. 203.)

[Printed, 10*d*. Drawings. See Repertory of Arts, vol. 10 (*third series*), pp. 99 and 168; also vol. 16 (*third series*), p. 116; London Journal (*Newton's*), vol. 5 (*second series*), p. 340; also vol. 3 (*conjoined series*), p. 42; Mechanics' Magazine, vol. 13, pp. 305, 308, 377, 381, 382, and 415; also vol. 14, p. 362, and vol. 15, pp. 418 and 435; Register of Arts and Sciences, vol. 5 (*new series*), pp. 72 and 215; Webster's Patent Law, p. 79 (also p. 140, case 161); Carpmael's Reports on Patent Cases, vol. 1, pp. 492 and 493; Rolls Chapel Reports, 7th Report, p. 120.]

A.D. 1827, August 1.—N° 5531.

(The abridgement of this Specification was omitted from Part I.)

MAUDSLAY, Joseph.—A marine engine with oscillating cylinders is so constructed that the frame receives the thrust, and the power is conveyed without going through the sleepers. The steam is led round and to the top and bottom of the cylinder by a

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such a claim. 2. That the Marquis de Jouffroy used a steamboat in A.D. 1783, but that no description of its machinery is found before that given by himself thirty years afterwards.

" Desblancs.—I inspected the model of Desblancs' steamboat, referred to at p. 34, Part I. of the Abridgment, &c.

" Fulton.—I inspected the original of Fulton's letter, referred to at p. 52, Note (*c*), of Part I. of Abridgment, &c. It contains drawings which are suspended with the letter in the Conservatoire in Paris.

" I have, &c.

" Temple, London, Jan. 14, 1858. John MacGregor."

The foreign inventions from A.D. 1830 will be noticed in Part III.

(*a*) *Propulsion of Aquatic Animals.*—(See *ante* note (*a*), p. 1 of Part I.)—Mr. Robert Mallet has observed that the Paramecium Caudatum and P. Compressum (Infusoria) propel themselves by paddling with cilia ranged in a spiral groove or sulcus passing obliquely along the body of the animal, or by the progressive vermicular motion of a protuberance traversing the groove like a wave of flesh. (See drawings of these in Ehrenberg's Infusioritherchen, Leipsig, 1838. Taf. xxxix., VII.* and XII.*, and descriptions at pp. 351 and 353.) The diagonal or oblique action of each cilium (or of the wave before mentioned) being resolved into a pressure along the animal's length and another across its body will be found to propel the animal, both by direct pressure (like that of a paddle-float), and by causing the grooved body to rotate, and therefore to progress as if moved by a screw-propeller. Thus the combined action of the paddle-wheel and screw-propeller is exemplified in a microscopic insect as well as in the Leviathan steamer.

D valve or slide, worked by an excentric; and there is a speedy communication between the cylinder and the condenser through a gudgeon, forming part of the slide case, and on which the cylinder vibrates.

[Printed, 1*s*. Drawings. See Repertory of Arts, vol. 7 (*third series*), p. 183; London Journal (*Newton's*), vol. 6 (*second series*), p. 211; Mechanics' Magazine, vol. 15, p. 162, also vol. 22, pp. 37 and 108].

A.D. 1828, November 29.—N° 5719.

(The abridgement of this Specification was omitted from Part I.)

D'ARCY, JOSEPH (as Executor of) BRODERIP, CHARLES.—1. Oscillating piston rods.

2. A horizontal marine engine turns a wheel low down in a vessel, and the motion is communicated to the paddle-shaft crank by a crank and connecting rod. Another shaft is so connected with an arm on the connecting rod by a secondary crank and rod as to determine the direction in which the paddle-shaft shall be turned.

3. Steam engines.

(This Patent is referred to in the Specification of a Patent in A.D. 1845, N° 11,017; see *post*, p. 193.)

[Printed 10*d*. Drawings. See Repertory of Arts, vol. 10 (*third series*), p. 29; London Journal (*Newton's*), vol. 6 (*second series*), p. 201; Register of Arts and Sciences, vol. 5 (*new series*), p. 34; Engineers' and Architects' Journal, vol. 3, p. 142.

A.D. 1831, January 15.—N° 6060.

SEAWARD, SAMUEL.—A receiver fixed above the boiler, is filled with the surplus steam, and the vacuum caused by condensing this is applied to raise water from outside the ship, and force it into the boiler, at a high temperature, or to raise water from the hold and discharge it.

[Printed, 5*d*. Drawings. See Repertory of Arts, vol. 12 (*third series*), p. 264; London Journal (*Newton's*), vol. 8 (*second series*), p. 199; Register of Arts and Sciences, vol. 6 (*new series*), p. 161.]

A.D. 1831, January 22.—N° 6063.

SMITH, ANDREW.—1. Propellers at the side of a vessel, mounted on a frame which turns on horizontal axles, while it has a motion back and forward, regulated by cranks and arms and adjusted by screws.

Each propeller is longer than that immediately in front of it.

2. A channel in a vessel's hull for the propelling apparatus, and guides behind the stern, consisting of canvass or flexible material supported vertically in the water by sinks and floats.

[Printed, 1*s.* 1*d.* Drawings. See London Journal (*Newton's*), vol. 7 (*second series*), p. 305; Register of Arts and Sciences, vol. 6 (*new series*), p. 167; Rolls Chapel Reports, 7th Report, p. 134.]

A.D. 1831, May 24.—N° 6120.

HOBDAY, Samuel.—A rotary steam engine. Steam is admitted to compartments in the rim of a wheel, which it turns by pressing successively on each of the divisions between the compartments, while "a faller or steam's fulcrum," with an angular motion, prevents the steam from acting on more than one division in each compartment.

[Printed, 6*d.* Drawings. See Repertory of Arts, vol. 13 (*third series*), p. 15; London Journal (*Newton's*), vol. 1 (*conjoined series*), p. 209; Register of Arts and Sciences, vol. 6 (*new series*), p. 302.]

A.D. 1831, July 13.—N° 6134.

POOLE, Moses.—1. Forcing air into a flue to increase the draft in the furnace.

2. A conical expanding piston, which is kept steam-tight by ribs and spiral springs.

3. A pump formed of two cylinders, in a watertight case. Their axes are parallel and their rims furnished with leaves, which in revolving nearly touch the concave between the corresponding leaves on the other cylinder (turning in the opposite direction), and thus create a partial vacuum so as to lift the water admitted between the cylinders.

4. An oar or paddle, with a feathering motion imparted to it by stops acting on the shaft.

[Printed, 4*d.* No drawings. See Repertory of Arts, vol. 13 (*third series*) p. 257; London Journal (*Newton's*), vol. 1 (*conjoined series*), p. 72; Register of Arts and Sciences, vol. 7 (*new series*), p. 66.]

A.D. 1831, August 2.—N° 6147.

ANDERSON, James Caleb.—1. Feathering paddles. The main shaft carries a wheel on each side of the vessel bearing on its periphery the paddle-floats, which swing on pins. The other end of each float is connected by a turning-pin to the periphery of another wheel outside the first, and with its axis parallel to bu excentric to that of the main shaft. The second outside wheel turns in a plummer-block carried on a semicircular bar external to the whole apparatus, and by chains this plummer-block may be moved along the bar so as to raise or lower the axis of the second wheel as may be required.

2. Paddle-wheels turned by cog-wheels worked by men acting on endless upright chains.

3. The same turned by cranks moved by men pulling and pushing a framework.

4. An adaptation of the last for land carriages.

(The Specification refers to Buchanan's Patent in A.D. 1813, N° 3741; see Abridgment, Part I., p. 59.)

[Printed, 1*s*. Drawings. See Repertory of Arts, vol. 13 (*third series*), p. 205; London Journal (*Newton's*), vol. 10 (*conjoined series*), p. 343; Engineers' and Mechanics' Encyclopædia, vol. 2, p. 548; Register of Arts and Sciences, vol. 7 (*new series*), p. 102.]

A.D. 1831, September 16.—N° 6161.

PALMER, George Holworthy.—A steam engine boiler and furnace. The cylinder has a piston-rod through each end, working two wheels like pullies by chains and rods. On the axis of one of those wheels is a crank connected with the crank of the paddle-shaft or driving wheel. This latter crank must be shorter than the former.

The pulley wheel turns back and forward and communicates continuous rotatory motion to the driving wheel.

The slide valves "requiring neither casings nor stuffing boxes" are pressed on their seats by springs.

The boiler has a self-regulating blast and a "steam calorific self-adjusting apparatus," by which the heat is transmitted through a metallic or other bath to distilled water. The products of combustion are discharged below the fire-grate. The steam is condensed by expanding in a large vessel, which may be elastic.

(Several letters of reference are omitted in the drawings.)

[Printed, 10*d*. Drawings. See London Journal (*Newton's*), vol. 10 (*conjoined series*), p. 121; Register of Arts and Sciences, vol. 7 (*new series*), p. 129; Engineers' and Mechanics' Encyclopædia, vol. 2, p. 543.]

A.D. 1831, September 28.—N° 6172.

BERRY, Miles.—1. A boiler in upright compartments, traversed by tubes in which the steam is generated. Water impregnated with potash and floating tallow surrounds an upper pipe in connection with the tubes, and by absorbing the surplus heat up to 284° Fahrenheit prevents explosion by removing the fire placed on a sliding furnace grate.

2. The eduction steam passes along the hollow crank shaft.

3. The steam is thus conveyed by hollow arms to condensers attached to each paddle-float. A jacket round the cylinder is filled with a salt solution floating tallow to grease the piston-rod, and leather washers with metallic rings on the piston are expanded by tallow acting through the (hollow) piston-rod.

(This Patent is referred to in the Specification of a Patent in A.D. 1833, N° 6390; *see post*, p. 114.)

[Printed, 10*d*. Drawings. See London Journal (*Newton's*), vol. 9 (*second series*), p. 10, also vol. 15 (*conjoined series*), p. 168; Rolls Chapel Reports, 7th Report, p. 136.]

A.D. 1831, October 13.—N° 6180.

HALE, William.—A scroll-shaped propeller revolves in a fixed case of a scroll or spiral shape with a tangential discharge pipe.

One side of the propeller is open, and the water is admitted at this side, or it is admitted at both sides of the propeller, which is then furnished with a plate dividing it in the middle.

In other forms leaves project from a drum revolving as a propeller, and discharging the water through the tangential opening as before. Propellers thus constructed may be applied so as to force water through the after part of a vessel.

[Printed, 6*d*. Drawings. See Repertory of Arts, vol. 13 (*third series*), p. 336; London Journal (*Newton's*), vol. 11 (*conjoined series*), p. 95; Register of Arts and Sciences, vol. 7 (*new series*), p. 137.]

A.D. 1832, January 17.—N° 6212.

GALLOWAY, Elijah.—Paddle-wheels. The end of the axle or shaft outside the paddle-wheel on each side of a vessel is connected by a universal joint with another paddle-wheel which revolves with the first, but hangs down so as to leave its axis at a constant angle with that of the shaft.

The lower part of the periphery of this additional wheel, therefore, approaches the inner wheel, while the upper parts of the two wheels are apart. The floats on the wheels are set at angles with their axles, and in opposite directions, so that while they act on the water they present a concave wedge-shaped enclosure to it, while the sides of them open as the floats leave the water.

[Printed, 6*d*. Drawings. See Repertory of Arts, vol. 14 (*third series*), p. 7; London Journal (*Newton's*), vol. 1 (*conjoined series*), p. 282; Register of Arts and Sciences, vol. 7 (*new series*), p. 163; Webster's Reports, vol. 1, pp. 250 and 269; Meeson and Welsby's Reports, vol. 2, p. 471.]

A.D. 1832, March 22.—N° 6250. (Prolonged.)

WOODCROFT, BENNET.—Increasing pitch screw-propeller. "A "spiral worm blade or screw coiled round a shaft or cylinder of any "convenient length and diameter, in such form that the angle of "inclination which the worm makes with the axis of the cylinder "continually increases, and the pitch or distance between the coils "or revolutions of the spiral continually increases throughout the "whole length of the shaft or cylinder upon which the spiral is "formed."

Two, three, four, or more spiral blades on cylinders are applied at the sides of a vessel in recesses, or at the stem, and are either wholly or partly submerged.

[Printed, 9*d*. Drawings. See Repertory of Arts, vol. 7 (*enlarged series*), p. 293, and vol. 15 (*enlarged series*), p. 243; London Journal (*Newton's*), vol. 1 (*conjoined series*), p. 349, and vol. 28 (*conjoined series*), p. 196; Register of Arts and Sciences, vol. 7 (*new series*), p. 295; Rolls Chapel Reports, 7th Report, p. 139; Bourne on the Screw Propeller, p. 24.]

A.D. 1832, September 22.—N° 6308.

TREVITHICK, RICHARD.—1. "Interposing between the boiler "and the working cylinder of the steam engine a long many-curved "heated pipe, through which the steam is forced to pass with great "rapidity, without being permitted to come in direct contact with "water."

2. Keeping the cylinder hotter than the steam within it, by enclosing it in a flue.

3. A vessel is propelled by water drawn in at the stern and ejected through the same pipe, with the orifice contracted.

4. Application of the first process to land locomotives.

[Printed, 7*d*. Drawings. See Repertory of Arts, vol. 15 (*third series*), p. 257; London Journal (*Newton's*), vol. 3 (*conjoined series*), p. 150; Engineers' and Mechanics' Encyclopædia, vol. 2, p. 554.]

A.D. 1832, November 7.—N° 6329.

GALLOWAY, ELIJAH.—1. A marine steam engine with two piston-rods, united by a crosshead, curved so as to allow the air pump to be placed at the end of the cylinder, and to be worked by a third piston-rod.

2. Paddle-wheels. The wheel on each side has two sets of paddle-floats, "set at an angle to the shaft, and also at an angle to each " other, such floats not standing opposite to each other but equi- " distant, and consequently enter and leave the water in succes- " sion."

Between the sets of paddle-floats is a fixed dividing board extending to about one-eighth part of their revolution, and thus preventing the water from escaping sideways until each paddle-float has nearly finished its effective action.

[Printed, 9*d*. Drawings. See Repertory of Arts, vol. 2 (*new series*), p. 280; London Journal (*Newton's*), vol. 5 (*conjoined series*), p. 273.]

A.D. 1832, December 17.—N° 6346.

HARDWICK, Joseph.—Feathering paddles. Each float turns on horizontal spindles, and is feathered by the action of a screw at the end of a rod in the (hollow) spoke of the wheel. The rod has a crown-wheel at its inner end, which is turned by a fixed wheel on the vessel's side.

[Printed, 5*d*. Drawings. See Repertory of Arts, vol. 1 (*new series*), p. 341; London Journal (*Newton's*), vol. 7 (*conjoined series*), p. 288.]

A.D. 1832, December 20.—N° 6351.

SAXTON, Joseph.—An endless rope is stretched over two spindles turning on horizontal axes when the rope is caused to move. Motion is communicated to a vessel by winding the upper part of the rope round a sheave of a pulley, and the lower part round another sheave fixed to the former, but of different size.

This mode of propulsion by differential pullies causes the body which carries them to move through a large space while the endless rope is moved only a short distance.

The adaptation to land-carriages is described.

[Printed, 9*d*. Drawings. See Repertory of Arts, vol. 16 (*third series*), p. 74; London Journal (*Newton's*), vol. 3 (*conjoined series*), p. 92; Engineers' and Mechanics' Encyclopædia, vol. 2, p. 563.]

A.D. 1833, January 22.—N° 6368.

M'CURDY, John.—1. On each side of a vessel a set of vertical arms with paddles at their lower ends, "of the South Sea form," are connected with cranks on two horizontal shafts placed across the vessel, and one over the other, so as to cause the paddles to dip successively into the water.

2. The plan may be adapted to a stationary vessel, so as to use the force of a current.

[Printed, 5*d.* Drawings. See London Journal (*Newton's*), vol. 14 (*conjoined series*), p. 312; Mechanics' Magazine, vol. 22, p. 465.]

A.D. 1833, February 21.—N° 6388.

HEBERT, Luke, and DON, James.—1. Rotary engines. An internal cylinder with pistons receding as they pass a stop revolves in another cylinder by the action of steam. The motion may be reversed by altering the induction and eduction passages by a moveable piston acting in a manner similar to that of the ordinary D valve. The shaft of the internal cylinder may be made hollow, so as to allow a propeller-shaft to pass through and to be geared in it by clutch-boxes.

2. Boilers.

3. The air and steam from the eduction passage is drawn by a fan through or among small tubes, so as to be condensed. The tubes may be below water.

[Printed, 1*s.* 11*d.* Drawings. See London Journal (*Newton's*), vol. 15 (*conjoined series*), p. 227.]

A.D. 1833, February 21.—N° 6390.

GORDON, Alexander.—1. A boiler in compartments, with vertical flue tubes arranged so that one or more compartments may be shut off from use for repairs. The water is kept at the same level in all the compartments by a force-pump (described).

2. Condensing the steam by a blast of air from a circular blower, which agitates water dashed against a vessel of extensive metallic surface containing the steam.

3. Rotary valves applied so as to cause the steam in one of two cylinders to act expansively during a certain part of the stroke, while the steam in the other cylinder is acting with full power, and vice versâ.

(The Specification refers to Berry's Patent, in A.D. 1831, N° 6172; see *ante*, p. 111.)

[Printed, 1*s.* 4*d.* Drawings. See London Journal (*Newton's*), vol. 15 (*conjoined series*), p. 168.]

For a notice of experiments with "Three-throw paddle-wheels," see Mechanics' Magazine, vol. 19, p. 231.

A.D. 1833, June 1.—N° 6431.

CARTER, George.—Paddle-floats. The floats are arranged in two sets inclined to the axis of the paddle-shaft in opposite directions. Their ends farthest apart enter the water together, and the other ends approach each other, leaving, however, a certain space between them. A valve closes this space when the floats are acting on the water, and when their efficient action is finished the valve opens and the water freely escapes.

[Printed, 5*d*. Drawings. See Repertory of Arts, vol. 3 (*new series*), p. 3; London Journal (*Newton's*), vol. 5 (*conjoined series*) p. 315; Mechanics' Magazine, vol. 23, p. 354.]

A.D. 1833, November 19.—N° 6507.

BRANDLING, Robert William.—A vessel is towed along a canal or river by a locomotive on a railway on the bank, and the locomotive is prevented from drawing itself off the rails by guide posts, pulleys, and beams.

[Printed, 1*s*. 8*d*. Drawings. See Repertory of Arts, vol. 2 (*new series*), p. 129; London Journal (*Newton's*), vol. 5 (*conjoined series*), p. 155.]

A.D. 1833, December 19.—N° 6526.

SUNDERLAND, Thomas.—1. A reciprocating submerged paddle swinging on a horizontal axis attached to a hollow rod moved horizontally fore and aft. A second rod passes through the first, and carries a stop-piece which keeps the paddle vertical during its effective stroke, and allows it to be turned to a horizontal position during the return stroke.

2. Feathering paddles. Each float turns on an axis in the prolonged spoke of the wheel, and it is caused to enter and leave the water edgeways by rods moved by guides acting like cams, which are fixed to the vessel.

3. Feathering paddles. Each float turns on a horizontal axis, and enters and leaves the water edgeways directed by apparatus similar to that just described.

[Printed, 1*s*. Drawings. See London Journal (*Newton's*), vol. 4 (*conjoined series*), p. 289; Rolls Chapel Reports, 7th Report, p. 149.]

A.D. 1833, December 20.—N° 6530.

DUNDONALD, Earl of.—1. "The application of two, three, " or more revolving pistons to such rotary engines as operate with

" a lunate space formed by including a small cylinder within a large " cylinder (and the circumferences of the two touching or intersect- " ing each other at one place) so as to leave a crescent-shaped " channel for such pistons to circulate in."

2. A vessel is propelled by machinery driven by air or gas forced from and drawn into receivers by mercury, which moves according to the rocking of the ship.

In some cases the mercury turns the machinery immediately by falling on a wheel with floats like a breast-wheel.

(The Patent is referred to in the Specification of a Patent in A.D. 1835, N° 6923; see *post*, p. 122.)

[Printed 1*s*. 8*d*. Drawings. See London Journal (*Newton's*), vol. 9 (*conjoined series*), p. 216; Mechanics' Magazine, vol. 22, pp. 29, 41, and 193.]

A vessel with a paddle-wheel at the stern, and steered by two rudders, was used at Liverpool in A.D. 1833. See Mechanics' Magazine, vol. 19, p. 235.

A.D. 1833, December 21.—N° 6534.

KYAN, JOHN HOWARD.—Water is forced through tubes under water, so as to propel a vessel.

The discharge aperture of each tube may be contracted as required, and an air vessel may be applied to equalize the pressure and motion.

[Printed, 6*d*. Drawings. See London Journal (*Newton's*), vol. 6 (*conjoined series*), p. 105.]

A.D. 1834, March 1.—N° 6570.

PINKUS, HENRY.—"A Pneumatic Railway." Between the rails is laid a tube, with an opening along its upper surface closed by a rope-like valve, which may be lifted from its grooved seat and lowered again by wheels.

A piston, fitting the tube, is connected with the railway carriage to be propelled, and the air in front of this piston being pumped out, the pressure of the atmosphere admitted behind the piston propels it along the tube.

In another plan the longitudinal aperture in the tube and the rope-like valve are replaced by a copper piece which makes the tube air-tight. The piston and carriage are connected by the attraction of magnets placed on opposite sides of the copper piece, but as near as possible to each other, so that the magnet on the piston acting through the copper piece draws the carriage.

This method of propulsion is applied to boats on a canal by laying down a line of tube on the towing-path.

(This Patent is referred to in another in A.D. 1835, N° 6885; see *post*, p. 121.)

[Printed, 1*s*. 9*d*. Drawings. See London Journal (*Newton's*), vol. 6 (*conjoined series*), p. 158; Engineers' and Mechanics' Encyclopædia, vol. 1, p. 36; Rolls Chapel Reports, 7th Report, p. 150.]

A.D. 1834, March 29.—N° 6585.

DOUGLAS, John Cooper.—1. An engine worked by admitting the atmosphere into a cylinder with two pistons separated by a division.

2. Paddles projecting from a vessel's bow, and drawn through the water by rods.

3. Buoyant cylinders attached to a vessel's sides, and working levers on deck to keep the vessel from upsetting.

4. The means already described applied to carriages on land.

[Printed, 1*s*. 1*d*. Drawings. See London Journal (*Newton's*), vol. 17 (*conjoined series*), p. 297; Rolls Chapel Reports, 7th Report, p. 151.]

A.D. 1834, June 23.—N° 6631.

SYMINGTON, William, and SYMINGTON, Andrew.—Feathering paddles. Two sets of floats are placed side by side in the wheel. Each float revolves on a spindle parallel to an arm of the wheel, and it is turned by a cogged rack and guide-plate fixed on the vessel's side, so that as the floats enter the water their inner edges nearly touch each other, and form a convex wedge (like the inside of a book half open). As they leave the water their edges separate until their surfaces are parallel.

[Printed, 1*s*. Drawings. See London Journal (*Newton's*), vol. 12 (*conjoined series*), p. 29; Mechanics' Magazine, vol. 22, p. 337.]

For an account of "A mode of propelling vessels without "paddles," see Mechanics' Magazine, vol. 21, p. 361.

A.D. 1834, July 26.—N° 6651.

EASTER, John, and ORKNEY AND TAPLOW, Thomas John Hamilton, Earl of.

" A peculiar mode of adapting rotary pistons in connexion with " revolving eccentric conducting shields, formed by segments of "cylinders sliding one within the other as the pistons go round." The vessel is propelled by water ejected from a rotary pump through a tangential opening. The revolving piston passes through a cylindrical vessel, which revolves with it inside the case holding the water. This revolving vessel is excentric to the revolving piston, which at one time passes through its centre, and at another divides it into two unequal segments. The piston and revolving vessel are enabled to adapt themselves for this purpose by forming the sides of the vessel of sheet metal pieces, which slide one within the other. The water may be drawn in from below, and the piston may revolve in a vertical plane.

[Printed, 6*d*. Drawings. See London Journal (*Newton's*), vol. 5 (*conjoined series*), p. 373; Rolls Chapel Reports, 7th Report, p. 154.]

A.D. 1834, October 10.—N° 6691.

ERICSSON, John.—A reciprocating propeller. Under the stern of the vessel hangs a frame, carrying broad vanes, which turn on horizontal spindles. The frame is caused to vibrate fore and aft in the water by a steam-engine; and by an arrangement of cranks and rods, each vane is caused to begin its effective stroke by presenting its edge to the water and slowly revolving until its surface becomes vertical, and then again gradually ending the stroke with the edge to the water—a position which it retains during the whole of the return stroke.

[Printed, 10*d*. Drawings. See London Journal (*Newton's*), vol. 14 (*conjoined series*), p. 35; Repertory of Arts, vol. 15 (*enlarged series*), p. 244.]

For a notice of a project for propelling steam-vessels by discharging water and by a screw, see Mechanics' Magazine, vol. 22, p. 36.

A.D. 1835, February 9.—N° 6760.

LEEMING, James.—Paddle-wheels and water-wheels are furnished with floats which move along grooves in the arms of the wheel. Each float is drawn in during the latter part of its action in the water by a stud travelling in an excentric groove or guide fixed to the side of the vessel or wheel case. The float is again protruded as it enters the water.

[Printed, 9*d*. Drawings. See Repertory of Arts, vol. 5 (*new series*), p. 21; London Journal (*Newton's*), vol. 9 (*conjoined series*), p. 13.]

A.D. 1835, March 16.—N° 6791.

CHURCH, William.—1. The machinery of a marine engine is fixed above to the boiler, which constitutes a framework. The main shaft is turned by a connecting rod from a bell-crank worked by the piston-rod.

2. The steam is condensed by a jet of distilled water, and the products are passed again into the boiler.

3. Locomotives on land.

4. Steam engines.

(Reference is made to a Patent in A.D. 1830, N° 6041, see *ante*, Part I. p. 102; to a Patent in A.D. 1832, N° 6220; and to a Patent in A.D. 1833, N° 6469, neither of the two latter Patents refer specially to Marine Propulsion.)

[Printed, 8*s*. Drawings. See London Journal (*Newton's*), vol. 9 (*conjoined series*), pp. 257 and 313; Rolls Chapel Reports, 7th Report, p. 160.]

A.D. 1835, March 28.—N° 6801.

HUMPHRYS, Francis.—Instead of the usual piston rod a hollow trunk is fixed to the piston, and works through a stuffing box in the cylinder head. The cross section of the trunk is rectangular, with the corners rounded off. The piston is connected to the crank by a connecting-rod which passes down the hollow trunk, and is attached to the piston by bearings which allow it to swing laterally inside the hollow trunk as the upper end moves the crank.

The stuffing-box in which the trunk moves may have three annular divisions. In the two outer gaskets of hemp, flax, or cotton may be pressed by screws. An intermediate compartment may be filled with steam to exclude the air when the other packing is defective.

(This Patent is referred to in the Specification of a Patent in A.D. 1845, N° 11,017; see *post*, p. 193.)

[Printed, 9*d*. Drawings. See Engineers' and Architects' Journal, vol. 3, p. 142.]

A.D. 1835, April 14.—N° 6815.

BOYDELL, James.—For propelling a ferry boat or a vessel in a canal an endless chain is laid along the bottom, supported on friction wheels or in a tube with a slit along the top, and passing round a drum on shore. The chain may be rendered buoyant by filling its links with wood.

A winch or whimsey at one side causes the chain to move, one part of it going in one direction and the other parallel part in an opposite direction. If a boat is attached to any part of the chain it will thus be drawn along.

[Printed, 7*d.* Drawings. See Repertory of Arts, vol. 4 (*new series*), p. 330; London Journal (*Newton's*), vol. 9 (*conjoined series*), p. 227.]

A.D. 1835, June 2.—N° 6845.

WILKINSON, William.—Paddle-wheels. The intermediate shaft can be detached from either or both of the paddle-shafts so that the paddle-wheels may be worked separately.

Each end of the intermediate middle shaft has a sliding crank plate which turns with it, but may be moved along the shaft so as to be disconnected from the crank pin of the adjoining paddle-shaft. When it is desired to connect the wheels again the crank plate is moved along the shaft, and the end of the crank pin presses as it turns on the surface of the plate until it drops into the hole in the plate, when they are secured to each other.

[Printed, 1*s.* 3*d.* Drawings.]

A.D. 1835, July 9.—N° 6857.

VINT, Henry.—Feathering paddles. Each float is suspended on a horizontal axis at about one-third of its breadth from one edge.

When the wheels revolve the float swings round as the heavier edge tumbles, and certain bridle bars or chains are used to regulate this turning movement so that each float will emerge from the water edgeways.

[Printed, 6*d.* Drawings. See London Journal (*Newton's*), vol. 14 (*conjoined series*), p. 123.]

A.D. 1835, July 10.—N° 6859.

BUSK, William.—Water pumped into a trough on a vessel flows through an orifice, and propels the vessel by acting on the same principle as Barker's mill.

The head of water, it is stated, should be small.

[Printed, 10*d.* Drawings. See Repertory of Arts, vol. 6 (*new series*), p. 15; London Journal (*Newton's*), vol. 14 (*conjoined series*), p. 182.]

A.D. 1835, July 10.—N° 6860.

ROGERS, John.—Paddle-floats, of various curved forms and different sizes, are caused to enter the water to different depths.

[Printed, 6*d*. Drawings. See Repertory of Arts, vol. 5 (*new series*), p. 295; London Journal (*Newton's*), vol. 14 (*conjoined series*), p. 181.]

A.D. 1835, July 13.—N° 6862.

MABERLEY, Frederick Herbert.—1. A windmill on a vessel's deck, turns a shaft and paddle-wheels.

2. An endless chain, turning on two horizontal spindles, and furnished with floats, which are directed by guides so as to act advantageously in the water.

[Printed, 9*d*. Drawings.]

A.D. 1835, August 17.—N° 6885.

PINKUS, Henry.—Improvements on apparatus described in his former Patent, March 1, A.D.1834, N° 6570; see *ante*, p. 116, relating to atmospheric railways, and their use in conjunction with canals. The improvements comprise a method of using a pneumatic locomotive engine, which runs on rails, and is in communication with the tube between the rails leading to a stationary pumping engine.

[Printed, 2*s*. 6*d*. Drawings. See Mechanics' Magazine, vol. 23, p. 65.]

A.D. 1835, August 18.—N° 6887.

GALLOWAY, Elijah.—Paddle-wheels. The floats are in divided portions, arranged so that one part enters the water after another, so as to lessen the shock and backwater. In general the parts of the divided floats may be fixed on a portion of a cycloid curve, but in extreme cases this may be departed from. The cycloid is that described by a point in the circumference of the circle described around the paddle-shaft axis as centre, and always touching the surface of the water as the vessel moves at its average speed.

(In fig. 1 of the drawings, the letter *d* should be placed at the intersection of the circle *b*, *b*, with the radial line *d*, *e*. An experiment, with divided floats, by Joshua Field, is referred to in the Specification, and a drawing given.)

[Printed, 10*d*. Drawings. See Repertory of Arts, vol. 5 (*new series*), p. 290; also vol. 13 (*new series*), pp. 220. 279, and 332; London Journal (*Newton's*), vol. 8 (*conjoined series*), p. 55; Mechanics' Magazine, vol. 24, p. 241, also vol. 32, p. 168; Webster's Reports, vol. 1, pp. 520 and 521; Webster's Patent Law, pp. 48, 50, 81, 109, 111, and 116, (also p. 140, case 156); Carpmael's Reports on Patent Cases, vol. 2, p. 567.]

A.D. 1835, August 26.—N° 6892.

HIGGINS, John Lane.—1. Sliding keels.

2. In a longitudinal trunk along the middle of a vessel or between the hulls of a double vessel is suspended a double wheel or a pair of wheels, with one or more paddles revolving on an excentric. The angle of the paddle may be varied, and the length and direction of the stroke regulated by two connecting rods attached to the upper arm of the paddle. The wheel attached to the paddle may be lowered so as to act as a sliding keel.

3. Windlasses.

[Printed, 5*d*. Drawings. See Repertory of Arts, vol. 6 (*new series*), p. 165; London Journal (*Newton's*), vol. 9 (*conjoined series*), p. 231.]

A.D. 1835, November 5.—N° 6923.

DUNDONALD, Earl of.—1. Machinery for locomotion on land.

2. Boats are drawn on canals by locomotive engines travelling on railways along the towing-paths.

The boiler of the steam-engine of the locomotive may be carried in the boat, and the steam be conveyed along a pipe to the locomotive engine on the bank. The waste steam may return by another tube to the boat, so as to blow off within the furnace chimney.

3. The hull of a vessel is made deep at the bows, and with a gradually rising floor towards the stern. Air is then blown through an aperture at the deepest point, and by its oblique action in ascending propels the vessel.

(Reference is made to a Patent in A.D. 1833, N° 6530. See *ante*, p. 115.)

[Printed, 2*s*. 2*d*. Drawings. See London Journal (*Newton's*), vol. 18 (*conjoined series*), p. 313, also vol. 21 (*conjoined series*), p. 475, for Disclaimer; Rolls Chapel Reports, 7th Report, pp. 167 and 175.]

A.D. 1835, November 7.—N° 6925.

SYMINGTON, William.—1. Condensing the steam from the cylinder, and cooling the surplus water from the air-pump by tubes laid along the keel exposed to the water outside a steam-vessel.

2. Regulating the supply of hot water to the boiler by a sliding plate opened and closed by a float in the boiler.

3. The water thrown up in spray by the paddle-wheels is led round the condenser and hot well to cool them.

[Printed, 7*d.* Drawings. See London Journal (*Newton's*), vol. 21 (*conjoined series*), p. 474, for Disclaimer; Mechanics' Magazine, vol. 25, p. 273, also vol. 27, p. 218.]

A.D. 1835, December 21.—N° 6963.

BAILLIE, John, and PATTERSON, John.—On each side of a vessel a number of upright oars vibrate on horizontal axes. The blade of each oar turns in a spindle which allows it to be feathered by stops for the return stroke. The oars are in sets, so arranged that one set is in effective action, while another on the same side of the vessel is in the return stroke.

[Printed, 1*s.* 3*d.* Drawings.]

A.D. 1836, January 19.—N° 6984.

HARSLEBEN, Charles.—A horse or man is caused to propel a vessel by walking up an inclined plane formed of an endless band which turns the axle of wheels or paddles by bars like cogs gearing into teeth on the axles.

The endless band is stretched over two rollers, and the frame which carries the apparatus may be adjusted so as to give any required degree of inclination to the footway.

[Printed, 1*s.* 6*d.* Drawings.]

A.D. 1836, January 26.—N° 6990.

PICKWORTH, Henry.—Feathering paddles. Each float consists of a frame turning on a horizontal spindle, one end of which has a small crank pin moved by a rod in connexion with an excentric fixed to the vessel's side.

The float frame has three upright vanes turning on vertical spindles which do not pass through the middle of each vane.

The paddle-floats thus remain vertical as they move round, and while their louvre-like vanes close when acting effectively in the first part of each revolution, they open by the action of the water when their horizontal speed through the water is less than that of the vessel.

The excentric may be turned to any required angle by a wheel with handles and pauls, by which the feathering action of the floats is to be reversed when the vessel is moved astern.

\ 2

In another arrangement a float frame fixed to the arm of the paddle-wheel is placed between every two revolving feathering float frames, and this frame holds three vanes on spindles so arranged that they shall open and let the water pass while the paddle-wheels turn ahead, but shall close and form a flat float for action on the water when the paddlewheels turn astern. The vanes may be fixed in this position by an iron rod, and then their action will be like that of ordinary paddle-floats.

In another arrangement the float cranks are turned by an excentric rim hanging upon friction rollers on the side of the vessel, or on the main shaft between the two sets of radial arms forming a paddle-wheel.

[Printed, 1*s.* 1*d.* Drawings. See Mechanics' Magazine, vol. 25, p. 321.]

A.D. 1836, February 9.—N° 6998.

MASSIE, Alexander, MORTON, Robert, RANWELL, William, and RANWELL, Ebenezer.—Paddle-floats which contract their surface until the effective part of the revolution. Each float consists of two frames of parallel rails, so arranged that the openings between the rails on one frame will be closed by the rails of the other frame slid over it.

In another arrangement the float is divided into louvre-boards, which are opened and closed by rods worked by cams.

The cams or excentrics are attached to the side of the vessel, and made so as to be adjusted for various speeds and circumstances.

[Printed, 9*d.* Drawings. See London Journal (*Newton's*) vol. 10, (*conjoined series*), p. 292; Rolls Chapel Reports, 7th Report, p. 170.]

A.D. 1836, February 17.—N° 7007.

BUCKNALL, William.—An endless chain passes round two wheels at the sides or in a case within a vessel, and acts on the water by floats.

[Printed, 5*d.* Drawings.]

A.D. 1836, March 21.—N° 7037.

HANCOCK, Walter.—Feathering paddles. Each float turns on a horizontal axis, and is feathered by a rod moved by an excentric on a fixed shaft embracing the outer end of the paddle-shaft.

The paddle-wheel may be turned horizontally so as to act when submerged, with a case having a tangential opening. Other arrangements are described for working the rods by a crank or by an excentric near the inside bearing of the paddle-shaft, also for adjusting the throw of the excentric and its position.

[Printed, 1*s.* 1*d.* Drawings.]

A.D. 1836, March 22.—N° 7040.

HALE, William.—1. A spiral propeller works in a cylinder between spiral planes, and, by its rotation, discharges the water through an orifice in the bottom of the vessel, which is thereby propelled.

2. Inside a boiler is an apparatus consisting of several circular discs ending in tubular openings arranged on an axis, in the manner of " Barker's mill." Steam from the boiler enters successively the several chambers enclosing the tubes, which, by their rotation, turn the axis.

3. A spiral working on an axis between spiral planes, as already described, is turned by steam.

4. A spiral tube turned back at the end revolves by the action of steam on the principle of Barker's mill.

(The figure not named on Sheet 2 of the drawings is figure 5).

[Printed, 1*s.* Drawings. See Repertory of Arts, vol. 7 (*new series*), p. 163; London Journal (*Newton's*), vol. 19 (*conjoined series*), p. 11.]

A.D. 1836, March 23.—N° 7043.

LILLIE, Sir John Scott.—1. Atmospheric railways. The carriage moves inside a tube, and is drawn forward by a piston in advance of it, and fitting the tube which is partially exhausted of air.

The upper part of the tube may be divided, and the two parts opening on hinges may be caused to fall back as the carriage proceeds, so as to allow the chimney of an auxiliary locomotive engine to pass along and the air to enter.

2. Boats to be towed on a canal are attached to a carriage carrying a mast, and moving in a tube such as that last described.

[Printed, 6*d.* Drawings.]

A.D. 1836, April 26.—N° 7072.

TAYLOR, William, and DAVIES, Henry.—The invention relates "Firstly, to improved or novel constructions of apparatus "for supplying water or other fluids into steam boilers or evapo- "rating apparatus; secondly, to novel or improved constructions "of machinery or apparatus forming rotatory engines, by which "mechanical power is obtained by the aid of steam; and thirdly, "in novel or improved arrangements or constructions of machinery "or apparatus for giving motion to and working certain descrip- "tions of paddles or propellers, and thereby communicating motion "to vessels floating in water."

In Sheets 7, 8, 9, and 10 of the Drawings the third part of the invention is illustrated.

1. A broad-vaned paddle is suspended in the water and vibrated to and fro behind the vessel. The edge of the paddle is turned to the water for the return stroke by a rod moving a lever on the axis of the paddle before the beginning of each stroke.

2. Two paddles are suspended at the end of a vessel, and are caused to vibrate fore and aft, while the edge of each paddle is turned to the water for the return stroke by the action of a crank which turns the paddle spindle through one quarter of a circle.

3. Two paddles, in a similar position with those last described, "are made to approach and recede from each other at angles, "propelling in each direction." The planes of the paddles are inclined to the direction of the keel of the vessel, and their spindles are turned by one crank, while a second vibratory motion is given to them in opposite directions.

4. A paddle is suspended on a ball and socket joint, and the spindle is turned by a crank and rod, while it is vibrated by another apparatus. "These rods and cranks are of such relative "lengths and are so placed with respect to the crank A and the "blade of the paddle, that they cause the blade of the paddle to "present a wide surface to the water as it passes through that "part of its motion which is most favourable to its propelling "action, and a narrow surface when its motion is less favourable," "thus producing an action similar to sculling with an oar."

[Printed, 3*s*. 2*d*. Drawings. See London Journal (*Newton's*) vol. 18 (*conjoined series*), p. 97; Mechanics' Magazine, vol. 29, p. 51; Rolls Chapel Reports, 7th Report, p. 174.]

A.D. 1836, May 31.—N° 7104.

SMITH, Francis Pettit.—" A sort of screw or worm made to " revolve rapidly under water in a recess or open space formed in " that part of the after part of the vessel commonly called the dead " rising or dead wood of the run."

A horizontal axis carries a broad-threaded revolving screw, the axis of which is supported on plummer-blocks at each end, and turned by a crown-wheel on an upright shaft in a water-tight case. The screw shown in the drawings annexed to the Specification has two turns of the thread.

By a Memorandum of Alteration, dated 30 April 1839, the patentee limits his invention to the use of the screw " described in " figures 1, 2, and 3, of the drawing annexed to the Memorandum " of Alteration, and placed singly in the centre of the dead wood or " run of the vessel, as shown in the figures of the drawing annexed " to the original Specification." The drawings annexed to the Memorandum of Alteration represent a screw with one turn of the thread, and another shaft with two screws upon it, the threads of which begin from opposite ends, of the same diameter, and continne (each of them) one half-turn.

[Printed, 7*d*. Drawings. See Repertory of Arts, vol. 7 (*new series*), p. 172 vol. 14 (*new series*), p. 284, for Disclaimer, and vol. 16 (*enlarged series*), p. 347, for extension; London Journal (*Newton's*) vol. 11 (*conjoined series*), p. 98, also vol. 23 (*conjoined series*) p. 466; Mechanics' Magazine, vol. 31, p. 225.]

A.D. 1836, June 24.—N° 7135.

HALL, Samuel.—1. Paddle-wheels. One half of the number of floats are placed diagonally in one direction and the other half diagonally in the other direction, so as to produce and act upon varying currents as the wheels revolve, and thus reduce the effects of vibration.

2. Improvements in steam-engines.

(Reference is made to another Patent in A.D. 1834, N° 6556, which does not relate to marine propulsion.)

[Printed, 1*s*. 5*d*. Drawings. See Repertory of Arts, vol. 7 (*new series*), p. 227; Mechanics' Magazine, vol. 28, p. 2, also vol. 30, p. 401.]

A.D. 1836, July 13.—N° 7149.

ERICSSON, John.—Spiral propeller. A horizontal shaft projecting through the stern-post carries a broad hoop, on which are short broad vanes, each of which is part of a spiral screw " b

" such a fall or inclination that it will not have passed once round " the cylinder until it has advanced along it a distance equal to " three times its diameter."

Another shaft passing through the first (which is hollow) carries a similar set of vanes astern of those on the first shaft, but fixed with their inclination in an opposite direction to that of the former vanes. The shafts are turned in opposite directions, and the speed of the inner shaft is greater than that which carries the first set of vanes. The rudder is divided so as to let the shafts pass through broad links connecting its upper and lower portions.

[Printed, 11*d*. Drawings. See London Journal (*Newton's*) vol. 14 (*conjoined series*) p. 34; Mechanics' Magazine, vol. 27, p. 130, vol. 28, p. 215, vol. 29, pp. 143 and 283, and vol. 42, p. 225; Artizan, vol. 8, pp. 187 and 209; Bourne on the Screw Propeller, pp. 30 and 34.]

A.D. 1836, August 11.—N° 7168.

LIGHT, Edward.—An endless chain passing over two wheels on a vessel's side carries a number of vanes, which are so attached to it by slides and bolts as to be easily removed when the wheels are to be disused for repairs or to allow the vessel to sail.

[Printed, 8*d*. Drawings.]

A.D. 1836, December 3.—N° 7238.

CARVALHO, David Nunes.—Paddle-wheels are turned by an upright shaft, on which is a horizontal wheel turned by the wind. The wheel consists of triangular prisms of wood and flat hinged plates or "inflexible sheets," arranged alternately one beneath the other in each of the radial arms of the wheel.

The wind acting on one side of the prism has more effect on that side which is vertical than on that which presents its edge to the wind. The wind, acting on the hinged plates, blows them open, passes through those on the radial arms coming against the wind and closes against stops those which are on the arms going away from the wind, and thus turns the wheel by the current acting on inclined surfaces and open hinged louvre-boards on one side of the axis, and acting on vertical planes on the other side.

[Printed, 6*d*. Drawings. See Repertory of Arts, vol. 8 (*new series*), p. 142.]

A.D. 1837, January 21.—N° 7288.

GILLETT, William Stedman.—At each side of a vessel near the stern below water is fixed a hinged plane, which may be inclined *at any angle*, by a rod moving one end up or down.

When the plane is in its middle position it is parallel with the surface of the water; when the stern end of it is raised the action of the water as the vessel sails through it depresses the stern and raises the bow, and when the end of the plane is lowered the water raises the stern and depresses the bow.

By means of these planes the trim of a vessel, fore and aft, and on its keel, may be regulated.

[Printed, 6*d*. Drawings. See Repertory of Arts, vol. 8 (*new series*), p. 150.]

A.D. 1837, February 6.—N° 7297.

GEMMEL, John.—1. A curved tapering piece is added at the back of each float of a paddle-wheel.

2. The floats may be trapeziums or triangles in shape instead of rectangles, and their broad ends may be turned outwards and inwards alternately, or in sets.

3. The float is divided longitudinally, and the middle piece is placed at a short distance behind the other two.

4. The float may consist of parts set as steps, so that the wheel has a larger diameter through one part of the axis than through the other, while the breadth of the float is the same throughout.

5. Ribs, grooves, or corrugations on the surface of the floats.

6. The edges of the float are serrated.

7. The float is curved, and presents its concavity to the water.

8. A hollow watertight tube is fastened to the outer arms of the wheel to make it buoyant.

9. A strengthening rim of iron surrounds the wheel outside the corners of the floats.

10. Paddle-wheels are placed outside a double hulled boat, and a " fender " is fixed between the hulls.

11. " Gemmell's Marine Vehicle."—A double hulled vessel is connected by a hollow flooring, the stern end of which is so far below water that when the whole vessel is sunk to a certain extent it will allow another vessel to come upon the flooring when the apparatus is made more buoyant by pumping in air to replace the water expelled, and the " vehicle " and the vessel carried by it may be propelled by paddle-wheels on the outside of each of the two hulls.

12. Two vessels to act as " camels " for carrying a ship between them are lowered so as to allow chains connecting their hulls to

sink below the vessel received between them. The steam-engine, in a separate towing vessel, pumps out the water by tubes connected to each camel, and raises the two camels so as to carry the other vessel by the chains when the whole apparatus is towed by the towing vessel.

13. Additional paddle-wheels are attached to steam vessels, and their shafts are worked by horizontal piston rods, which pass through both ends of the cylinders.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1837, February 16.—N° 7301.

BURCH, Richard.—1. Locomotive engines.

2. A disc valve " constructed upon the principle of an ordinary " ventilator," with sector openings.

3. By interposing a similar plate between the two constituting the valve the reversing motion is attained.

4. Oscillating engines. The cylinder oscillates on a gudgeon at its lower end, and the piston rod works between guides on the top of the cylinder.

The valve motion is obtained by the mere change of the relative position of the sector openings on the plates, one of which is fixed and the other is attached to the cylinder so as to open and close the ports as it passes over the openings in the first plate.

[Printed, 1*s*. 1*d*. Drawings. See London Journal (*Newton's*), vol. 11 (*conjoined series*), p. 352; Rolls Chapel Reports, 7th Report, p. 184.]

A.D. 1837, March 15.—N° 7323.

SNODGRASS, Neil.—A steam-boat is constructed with a paddle-wheel between two hulls, each of which is a conical air-tight metal tube, divided into compartments. There are two rudders.

The paddle-shaft carries a spur-wheel gearing into another spur-wheel turning on a stud, and the steam-valve is thus worked by a rod and rollers, which may be adjusted so as to work the steam expansively.

[Printed, 10*d*. Drawings.]

A.D. 1837, May 8.—N° 7368.

SPURGIN, John.—An endless chain carrying floats revolves at each side of a vessel upon three wheels, on horizontal axes.

The wheels at the bow and stern ends of the loops may be moved so as to tighten the chain. The centre wheel is larger than the others, and has teeth which catch in the chain links. These links are like those in a watch chain, and there are back pieces on alternate links, which give to the chain greater rigidity, so that the floats enter the water, and pass through it nearly in the same manner as if they were on the circumference of a very large paddle-wheel.

Part of the invention is applied to other purposes.

[Printed, 1*s*. 1*d*. Drawings. See Repertory of Arts, vol. 9 (*new series*), p. 203.]

A.D. 1837, September 7.—N° 7429.

GIFFORD, JAMES.—Feathering paddles.

1. Each float turns on a horizontal axis which does not pass through its centre, but so that the larger amount of surface is above the axis when the float is below water, and by this means the pressure on the float is equalized, and the strain on the feathering gear is reduced. Each float is feathered by a rod from it jointed to a circular collar turning on an excentric piece attached to the vessel's side. This collar is also connected by short links on pins with a rim on the paddle-wheel, so that the motion of the collar is governed by the links, which will always be parallel to each other.

2. In order to alter the position of the axis of the excentric piece when it is required to cause the floats to enter the water at a certain angle, the short links last mentioned are each of them jointed in the middle, and their middle joints are connected by rods, so that a certain amount of 'play' is allowed when the excentric piece is to be moved.

The axis of the circular excentric piece is not fixed to the vessel's side, but is moveable along a curved slotted fixed plate by means of a lever inside the vessel which turns an axis carrying a toothed wheel which moves a rack on the excentric piece. The lever may be set at any required angle by binding pins in a semicircular grooved fixed piece; and thus the position of the axis of the circular excentric piece will depend upon the position of the lever.

3. The positions of the inner ends of the rods from the floats to the excentric may be adjusted by another arrangement. Instead of being attached to the circular rim by pins, each of these inner ends is attached by a pin to a short grooved piece forming part of a circle,

and moveable on the outside rim of the excentric, to which they may be clamped between two plates. To secure these rods at equal distances short rods with pins connect them in pairs.

(In page 4, line 8, of the printed Specification, the words " axis *b*," are probably intended to represent axis *l*.)

[Printed, 1*s*. 9*d*. Drawings. See Repertory of Arts, vol. 11 (*new series*), p. 33.]

A.D. 1837, September 14.—N° 7431.

CAVE, THOMAS JOHN.—Paddle-wheels. The usual outer set of radial arms of the paddle-wheel are dispensed with. To the inner set of arms is fixed a disk and a cone concentric with the paddle-shaft, and with its vertex at the outer bearing of the shaft. Each of the floats is fixed to the disk and the cone by two of its edges which are inclined to each other at an angle, while the outside edge is curved in shape and free to the water. The inner edge passes partly round the cone in a spiral direction. In large wheels a ring may connect the outside edges.

(Fig. 4 in the drawings appears to be referred to as fig. 3, and *vice versâ*.)

[Printed, 6*d*. Drawings. See Mechanics' Magazine, vol. 33, p. 193.]

A.D. 1837, October 20.—N° 7449.

PALMER, HENRY ROBINSON.—A canal is constructed with two separate channels, and the water in each of them is kept flowing always in one direction. This is effected by uniting the channels at one of the ends, and working a water-wheel, which continually raises the water from the end of one channel to that of the other channel which is higher. By this means a constant flow of water is kept up in a circuit, so that barges going or coming will be carried by the stream.

[Printed, 6*d*. Drawings. See Repertory of Arts, vol. 10 (*new series*), p. 27; London Journal (*Newton's*), vol. 15 (*conjoined series*), p. 278; Engineers' and Architects' Journal, vol. 1, p. 70.]

A.D. 1837, December 19.—N° 7519.

HALL, WILLIAM SANDFORD.—Paddle-wheels. 1. Each float is placed diagonally on the wheel, and the next float is placed diagonally inclined in an opposite direction, so that all the alternate floats are parallel to each other, the ends of adjoining floats being brought together at the points where the rim is joined to the arms on either side.

2. The wheel is divided into two parts through the whole circumference, each part having its floats set as in the form first described.

3. "In place of having the float-boards of a flat surface, I make "them of boards or plates of iron, slightly twisted in their length, "in order that the ends thereof may come evenly together; and "also for allowing of their being more readily affixed to the arms "or spokes *b*; and when wood is used for the float-boards, I "steam them, as is well understood, and then by means of wedges "cause the corners of the board to be forced in opposite directions, "as is well understood in twisting boards, or in any mode to "obtain a permanent twist in the length of the boards."

[Printed, 9*d*. Drawings.]

A.D. 1837, December 23.—N° 7524.

ELVEY, John.—Paddle-wheels. The wheel has a rim in the middle, and the floats are set diagonally on each side of this rim, so that the wheel has two sets of floats inclined to its axis at opposite angles, the floats in each set being parallel to each other.

The ends of the floats, which are fixed to the outer and inner circumferences of the wheel when made of metal, are bent in a curved form, so as to embrace the water, and flat pieces are added at those points (flush with the arms of the wheel) to confine the water.

In each float are valves to let the back-water run out. Each valve consists of a rectangular piece suspended on an axis not passing through its middle.

When the float is in the water, the valve closes on a stop; but on emerging, that part which is first uncovered yields to the other, and the valve opens to let the water come through.

[Printed, 8*d*. Drawings. See Repertory of Arts, vol. 10 (*new series*), p. 91.]

A.D. 1838, January 18.—N° 7544.

TARNER, Julian Augustus.—A double-hulled vessel is propelled by a paddle-wheel in the middle. Astern of the wheel is a curved platform or "wave queller," which receives part of the back-water, and moderates the swell caused by the paddle-wheel.

[Printed, 9*d*. Drawings. See Repertory of Arts, vol. 10 (*new series*), p.142.]

A.D. 1838, January 30.—N° 7557.

HUMPHREYS, John Barnett.—1. A two-way conical cock for opening and closing the steam-passage to and from the cylinder. The number of openings in the cone may be increased. The steam passes in and out at one end of the cone, which is kept in its seat by a set screw and key, with a stuffing-box in large engines.

2. "Field's regulator" combined with or added to "another "regulator, or part of one, to reverse the motion of the crank- "shaft, and between the two a cylindrical part, of such diameter "as will keep the cone of the cock in such a position as shall "cut off all communication between the cylinder and boiler and "condenser." The regulator is divided into steps connected by slopes, and may be placed on the crank-shaft. The engines may be controlled by one regulator, by placing the frames which carry the rollers across each other, and adjusting the position of each frame to its respective crank.

3. A slide "so arranged that a portion of the steam passes from "one side of the piston to the other side when the piston is near "the end of its stroke."

4. Holes near the ends of the cylinder "leading to passages to "the top and bottom, with a self-acting valve conveniently situated "that shall let the steam pass only one way."

5. Surface condensation by leading the steam through tubes in a vessel kept cold by a flow of water. The condensed water passes over and under vertical partitions to remove the oil, and is pumped into the boiler.

6. The use of two or more condensers for the same cylinder, condensing separately the steam from above and below the piston.

7. A small additional boiler or still heated by a flue from the engine boiler, from which steam passes to the condenser or air-pump to supply the waste.

[Printed, 1*s*. 7*d*. Drawings. See Mechanics' Magazine, vol. 29. p. 8.]

A.D. 1838, February 26.—N° 7562.

MELVILLE, John.—1. Boilers.

2. Two cranks at one side of a vessel are each linked to a bar, the upper end of which is jointed to another bar turning on a fixed *hinge* joint, and the lower end carries a float or vane, which is

moved in the water by the crank, and raised out of it for the return stroke. The cranks are so placed that one float shall be in the water while the other is returning through the air.

The title of this Patent was altered by a Memorandum of Alteration, dated May 1, 1838.

(The Patent is referred to in the Specification of a Patent in A.D. 1841, N° 8805. See *post*, p. 159.)

[Printed, 1*s*. Drawings. See London Journal (*Newton's*), vol. 21 (*conjoined series*), p. 476, for Disclaimer.]

A.D. 1838, February 8.—N° 7564.

ESSEX, Robert.—Paddle-wheels. One half of the paddle-wheel (cut off by a diameter) is attached to the rest by joints and nuts. When it is desired to sail the vessel without dragging the paddles in the water, the wheel is turned so that the moveable part is uppermost. The moveable ends of guides and rollers are placed under the sternmost end of this part, and the joints and nuts being set loose the wheel is turned slowly astern, which will move the upper moveable portion back along the horizontal guides until it is clear of the rest of the wheel, and rests astern of it under the paddle-box, which is elongated towards the stern for this purpose.

The wheels may be detached in quadrant pieces and slung up, one forward, the other aft of the fixed part which is kept uppermost while the vessel sails.

[Printed, 1*s*. 1*d*. Drawings. See London Journal (*Newton's*), vol. 15 (*conjoined series*), p. 422.]

A.D. 1838, February 27.—N° 7579.

HOLEBROOK, Josiah Pearce.—1. Feathering paddles. Each float turns on a horizontal axis, and is feathered by rods on a wheel, whose axis is on a crank placed above and excentric to the paddle-shaft.

The paddle-shaft is divided between the two circular frames of the wheel, and part of the feathering apparatus revolves on the crank in the space between the parts of the shaft. The motion is communicated from one part of the shaft to the other by the spindles in which the floats turn, and by a "star-wheel," the outer ends of the arms of which are fixed to one of the circular rims of the wheel, and the inner ends to the end of the divided part of the shaft adjoining the other circular rim, the arms being placed, not vertically, but inclined so as to revolve in a conical path, and thus allow room for part of the feathering-wheel on the crank to move within the cone. The feathering-wheel is further attached to the circular rim of the paddle-wheel by two links on pins in a bar which crosses some of the arms.

2. Shifting paddle-floats. Each float may be moved along the arms of the wheel by screws at each end. The screws are turned by a reel on the paddle-shaft between the circular parts of the wheel, and loose on the shaft until brought into action. At each end of this reel is a toothed wheel which gears into small toothed wheels on the screws lying along the spokes of the wheel and moving the floats out or in. To turn this reel and move the screws a wheel turning loose on this shaft outside of the paddle-wheel is clamped, so that the wheel is fixed while the shaft turns loose in it, and this clamped wheel turns a small wheel between two of the spokes of the paddle-wheel, which small wheel turns the toothed wheel in one end of the reel. Thus by turning the paddle-shaft ahead or astern while the clamped wheel is fixed, the floats will be moved to or from the shaft.

The floats may be reefed by forming each float of two pieces, one of which slides behind the other.

[Printed, 10*d.* Drawings. See Repertory of Arts, vol. 10 (*new series*), p. 360; London Journal (*Newton's*), vol. 13 (*conjoined series*), p. 61; Mechanics' Magazine, vol. 30, pp. 161 and 385.]

A.D. 1838, March 8.—Nº 7586.

HALE, WILLIAM.—1. A steam-tight case is fixed inside a boiler, and steam admitted through pipes to turn wheels by impinging on vanes set obliquely on their circumferences. The steam then proceeds by another pipe to work a steam-engine, and the wheels are caused to turn machinery.

2. A propeller with an axis carrying spiral vanes revolves in a case at the bottom of a vessel, and the water admitted to it by an inclined tube at one end is discharged at the other between spiral curved guides so as to propel the vessel.

The shaft of the propeller may be inclined to the horizon, or two propellers may be fitted to the same shaft in an oval case.

[Printed, 1*s.* Drawings.]

A.D. 1838, March 24.—N° 7599.

LOWE, James.—Screw propeller. A horizontal shaft rotates below water at the stern or other part of a vessel, and carries one or more "curved blades, each a portion of a curve which if continued would form a screw."

The drawings show a shaft with one blade, a shaft with two blades in the same line with each other through the shaft, and a shaft with four blades. It is recommended to work "each section of a screw or blade out of the line of all other blades."

(Reference is made to Shorter's Patent, A.D. 1800, N° 2371, see *ante*, Part I., p. 49.)

[Printed, *6d.* Drawings. See Repertory of Arts, vol. 10 (*new series*), p. 266; vol. 5 (*enlarged series*), p. 101; vol. 8 (*enlarged series*), p. 58; vol. 15 (*enlarged series*), pp. 231, 302, and 382; and vol. 19 (*enlarged series*), p. 49; London Journal (*Newton's*), vol. 13, p. 95; vol. 26 (*conjoined series*), pp. 47 and 52; and vol. 32 (*conjoined series*), p. 140; Mechanics' Magazine, vol. 31, p. 49; vol. 41, p. 461; vol. 48, p. 213; vol. 55, pp. 453, 462, 474, and 514; and vol. 56, p. 167; Patent Journal, vol. 4, pp. 358 and 540; vol. 6, p. 69; and vol. 8, p. 254; Law Journal Reports (Chancery), vol. 21, p. 97; Hare's Reports, vol. 9, p. 415.]

A.D. 1838, April 10.—N° 7612.

REDMUND, David.—1. A canal boat is constructed in three watertight jointed compartments, the bow and stern compartments may be turned up by racks and wheels so as to stand vertically when passing through a lock, when the boat may be kept steady by rods to the bank.

2. Boats on a canal have their ends concave and convex so as to be jointed together, and thus form a continuous train.

3. Construction of vessels.

4. The bottom of a vessel has a channel way so as to allow the propeller or submerged paddles to act on the water without reaching below the external planking on each side.

5. Construction of vessels.

6. Submerged propeller. A paddle-wheel turns in a case, and the water is caused to fill it by withdrawing the air from the upper part.

Each float turns on a horizontal axis and is caused to lie flat on an internal cylinder during the upper part of its stroke, and to protrude at the proper time by the action of excentric guides or railways which, by roller wheels, actuate an arm attached to the float.

7. A semicylindrical cover may be so turned from above the submerged paddle-wheel as to enclose its lower part, and the water may then be pumped out when repairs are to be done inside.

8. Furnaces and stuffing boxes.

(Reference is made to a Patent in A.D. 1826, N° 5543; also to a Patent in A.D. 1824, N° 5032. Neither of these refer to Marine Propulsion.)

[Printed, 1*s*. 10*d*. Drawings.]

A.D. 1838, May 1.—N° 7629.

TAYLOR, JOSEPH JEPSON ODDY.—Screw propeller. The horizontal shaft turning in the dead wood carries two blades at opposite ends of a diameter. Each blade is flat like an oar, with a rounded end and bevelled sides. The plane of the blade is set at an angle of 22° to the axis of the shaft. To enable the propeller to be hoisted out of water the shaft is formed in two parts, so that when that part inside the vessel is withdrawn through the stuffing-box it releases the external part on which the arms are fixed. This latter part may then be lifted by two vertical screws working hooks or slings, which travel in grooved vertical guides on the stern-post and false stern-post.

[Printed, 8*d*. Drawings. See London Journal (*Newton's*) vol. 13 (*conjoined series*) p. 346; Mechanics' Magazine, vol. 32, p. 17, also vol. 43, p. 316; Bourne on the Screw Propeller, p. 34.]

A.D. 1838, June 5.—N° 7671.

PARLOUR, SAMUEL.—1. A means of communicating motion from one revolving shaft to another, so that one shall turn twice while the other turns once round.

One shaft has at the end a disk with two grooves crossing each other at its centre at right angles. The other shaft has at its end a cross piece with a stud or friction roller at each end. If the studs be of such a size as to travel along the grooves of the disk, and if the distances between their centres be not more than the radius of the disk, and the shaft carrying them be placed with its axis parallel to that of the other shaft, and the centre of one of the studs on the centre of that other shaft and in one of the grooves, the shafts will be coupled, so as to rotate together; but that with the studs will turn twice, while that with the grooves turns once.

2. Feathering paddles. Each float turns on a horizontal axis, and has a small crank connected to a bar forming the spoke of a wheel which is carried on a crank, so as to be excentric to the axis of the paddle-wheel. The shaft of this crank works on the shaft carrying part of the paddle-wheel by an apparatus of the kind described in the first part of the invention, so that the excentric revolves only half round in its centre, while it turns once round the main-shaft. The floats will therefore be feathered, so as to point always to the top of the vertical diameter of the paddle-wheel.

The main-shaft may be divided, and the driving part be attached to that part of it carrying the paddle-wheel by a similar apparatus to that first described, so that one revolution of the main-shaft will produce two of the paddle-wheels.

[Printed, 9*d*. Drawings.]

A.D. 1838, June 14.—N° 7691.

GOODRIDGE, Richard.—"A new or improved apparatus for "lifting and raising fluids on water or on land, and for marine "propelling purposes, without steam." The Specification describes a pump with two pistons in one cylinder.

By a Memorandum of Alteration, dated November 28, 1838, the patentee omits from the title of the Patent the words "and for "marine propelling purposes."

[Printed, 10*d*. Drawings. See London Journal (*Newton's*), vol. 21 (*conjoined series*), p. 476, for Disclaimer.]

A.D. 1838, July 11.—N° 7729.

CALLET, Louis Cyprien.—A magnetic engine. An iron bar fitting loosely into the cavity inside a cylindrical helix is caused to be drawn into the helix by sending a galvanic current through the wires.

Two such bars and helices are placed so that they shall rise and fall alternately, being connected to the ends of a beam. A shaft turned by a connecting rod from the beam has a wooden roller at one end with semicircular slips of metal upon it, which break and renew the currents as they revolve in connexion with the ends of wires forming parts of the circuits about the helices. Each bar is drawn into the helix alternately, and lifts the other out of its helix, the current of that helix being cut off during the raising of the bar. Four or more parallel helices may be used, and the bars may be joined in pairs as horse-shoe magnets.

[Printed, 7*d*. Drawings. See London Journal (*Newton's*), vol. 15 (*conjoined series*), p. 154.]

A.D. 1838, July 11.—Nº 7730.

VAN WART, HENRY, and GODDARD, SAMUEL ASPINWALL.

1. Signals on railways and lenses for lamps.

2. Locomotive engines.

3. The slide valves of an engine are worked by a "link motion," by which a lever with two forked ends is caused to gear in the stud on one or another of two arms, at opposite sides of the axis of a shaft, moving the slide valve, and thus to turn the engine ahead or reverse it.

4. The steam is cut off at any required part of the stroke of the piston by moving the bearings of two arms out or in by a screw, and these arms act on the throttle-valve at different times, and for different periods, according as they are thus adjusted.

[Printed, 1*s*. 8*d*. Drawings.]

A.D. 1838, July 26.—Nº 7743.

PRICE, JOSEPH.—A boiler for marine engines. Horizontal flues of about fourteen inches wide reach from the furnace end to the end of the boiler, where they have doors or covers through which may be removed the dust accumulating at the ends. Each flue turns upwards by an angle piece, and goes back along the boiler to the other end, where there is a similar door or cover, and by another angle piece the flue goes again horizontally until it reaches the chimney.

The boiler is set high on pillars in the vessel. A second safety valve, made of a ball in a cup socket, is to be placed where it cannot be touched by the engineer.

[Printed, 7*d*. Drawings. See London Journal (*Newton's*), vol. 14 (*conjoined series*), p. 42.]

A.D. 1838, July 26.—N° 7745.

GRAY, John.—A Disclaimer and Memorandum of Alteration was entered, dated April 22, 1848, and the Specification thus altered comprises:—

1. Apparatus for "the lap, the lead, and the speed or motion "of the slide valves, rendering them capable, at pleasure, of intro-"ducing such a charge of steam to the cylinder as the resistance "to be overcome may require." "The means whereby I accom-"plish this object is through a variation produced in the lead of "the excentric or other apparatus employed in moving the valves, "by varying the direction or angle of what I call the excentric rod "or lead rod." This is described at length, and tables given for regulating the lap, lead, excentric rod, and valve motion for different charges of steam to the cylinder.

2. Improvements in locomotive engines.

3. Condensing apparatus by using "a suitable machine or "apparatus to apply the power lost in the introduction of the "injection, whereby I can with advantage introduce the injection "in greater quantities." The apparatus is "similar to that of "a small steam-engine cylinder, having three parts and a slide-"valve of the most simple construction."

4. Improvements in locomotive engines.

[Printed, 1*s.* 3*d.* No drawings. See Patent Journal, vol. 11, p. 270.]

A.D. 1838, July 26.—N° 7749.

FRAISSINET, Frederic Edouard.—Increasing pitch screw propeller. A horizontal shaft turns on each side of a vessel, and carries a spiral screw of one or two threads, each of them of continually increasing pitch. The thread is described by winding "a "parabolic curve" on a cylinder. The screw when it first enters the water meets little resistance. The screw blades are supported by arms fixed on the shaft, so that the water may pass through the centre round the shaft. "The distance between the two extremi-"ties of the spiral is nearly equal to the external diameter of the "screw."

[Printed, 6*d.* Drawings. See London Journal (*Newton's*), vol. 14 (*conjoined series*), p. 238.]

A.D. 1838, August 15.—N° 7771 (*a*).

REINAGLE, Ramsay Richard, and D'HARCOURT, George Robert.—A vessel has under water a chamber made of waterproof lining in which a piston works fore and aft, or a flap-shaped paddle on a spindle or ball and socket joints, or a propeller like two doors nearly meeting each other, and moved by a universal joint at the end of a rod.

[Printed, 4*d*. No drawings.]

A.D. 1838, August 30.—N° 7790.

HEYWORTH, Lawrence.—Rotary engines. A drum revolves in a steam-tight case. The drum may be a pentagon, and has a moveable abutment to keep the steam admitted between each plane face of the drum (as it revolves) and the angle rounded off which touches the case; a longitudinal piece, called an " epiglottis," falls and rises by springs pressing it, or by steam acting in a cylinder.

Other forms are described, in which a circular drum revolves within a case excentric to it, and arms in the drum are protruded and withdrawn into receptacles by the means used above for the " epiglottis."

[Printed, 9*d*. Drawings. See London Journal (*Newton's*), vol. 16 (*conjoined series*), p. 37.]

A.D. 1838, September 6.—N° 7797.

BURSTALL, Timothy.—1. Boilers, rotary engines, locomotive engines, and railway carriages.

2. A wheel with vanes revolving in a case discharges (by centrifugal force) water received at one side of the axis, and thus propels a vessel.

[Printed, 1*s*. 4*d*. Drawings. See Mechanics' Magazine, vol. 31, p. 422, vol. 32, p. 677, and vol. 35, p. 17; Engineers' and Architects' Journal, vol. 2, p. 306.]

A.D. 1838, September 27.—N° 7821.

REES, John Hughes.—" Certain improvements in machinery " applicable to the raising of water for propelling boats, carriages, " and other machinery." Pumps are worked by levers, racks, toothed wheels, excentrics, and chains.

[Printed, 6*d*. Drawings. See Repertory of Arts, vol. 12 (*new series*), p. 35.]

(*a*) In the printed copies the Patent is incorrectly dated A.D. 1839.

A.D. 1838, November 13.—N° 7870.

SMITH, George,—1. Paddle-box boats. The upper parts of the paddle-box and of the cabins near to it are formed of boats inverted and without thwarts. Each boat rests on levers, by which it may be raised on its outer edge until its gunwale is vertical, when a chain from the upper edge of the gunwale run through a davit on the inner side of the paddle-box allows the boat to be lowered into the water for use.

2. Screw propeller. A hollow horizontal shaft turns in the dead-wood of the vessel in a stuffing-box, and carries two blades of a screw. Another shaft turns within the first, and projecting astern beyond its end carries two other blades with their inclination in an opposite direction to that of the first pair. Each shaft has a bevilled wheel inside the vessel. These wheels face each other, and both gear into a horizontal bevilled wheel, moved by the engine. The shafts are thus turned in opposite directions.

In order that the propellers may be removed out of the water, the bearings are furnished with top pieces, moving in grooves, and secured by keys passed through part of the framework. These keys being taken out, and the top pieces removed, and the shafts drawn back out of the bosses of the propellers, the blades with their bosses may be taken out.

The shafts may be readily disunited and the propellers worked by bands taking into grooved sheaves on the edges of the wheels on the shafts.

3. A shaft with an inclined vane or screw propeller works at each side of the rudder, the shafts turning in opposite directions.

[Printed, 10*d*. Drawings. See London Journal (*Newton's*), vol. 15 (*conjoined series*), p. 171.]

A.D. 1838, December 1.—N° 7884 (*a*).

TAYLOR, Peter.—1. Screw propellers. Two shafts carrying curved vanes or screws work so near each other that the vanes of one shaft pass between those of the other.

2. Rotary engines. A drum revolves within a steam-tight case, and pistons or slides are protruded and withdrawn to pass the abutment by guides acting on rollers or pullies on the guides, or

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(*a*) In the printed copies the Patent is incorrectly dated A.D. 1839.

by an internal cam or guide acting on the ends of the slides. The end plates and other machinery are so constructed as to allow of their being readily fitted and repaired. The metallic packing is adjusted by external screws.

[Printed, 2*s*. 5*d*. Drawings. See Repertory of Arts, vol. 12 (*new series*), p. 321.]

In A.D. 1838 Jacobi produced a vessel upon the Neva worked by electro-magnets (*a*).

A.D. 1839, January 17.—N° 7940.

HEGINBOTHAM, WILLIAM HOLME.—Two horizontal shafts across a vessel carry two cranks at each of their ends, the throws of the cranks in opposite directions.

A frame with vertical paddles, one behind the other, is mounted on each pair of corresponding cranks, so that there are four frames, two on each side of the vessel, of which one frame is in the water while the other (by the revolution of the shafts) is making its return stroke through the air. The paddles are thus moved through the water nearly in a horizontal direction, and their surfaces are always vertical.

[Printed, 9*d*. Drawings. See London Journal (*Newton's*), vol. 15 (*conjoined series*), p. 79.]

A.D. 1839, January 22.—N° 7946.

HADDAN, JOHN COOPE.—Screw propeller. "Forming or using "of screws with openings or spaces in their threads." The screw or spiral is fixed to the shaft by arms.

[Printed, 6*d*. Drawings. See Repertory of Arts, vol. 14 (*new series*), p. 276; London Journal (*Newton's*), vol. 18 (*conjoined series*), p. 116.]

A.D. 1839, March 20.—N° 8006.

RUTHVEN, JOHN, and RUTHVEN, MORRIS WEST.—1. Boiler and condenser.

2. Water admitted at a vessel's bow is forced out at the stern to propel the vessel.

A centrifugal pump revolving on a vertical shaft in the passage of the water has vanes closed above but admitting the water below, and open at the edges to allow it to be discharged towards the stern (through two openings in the cylindrical case) by two passages opening at the sides of the vessel "at, near, or above the surface of

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(*a*) "Times" newspaper, Dec. 26, 1857, p. 9, col. 4.

"the water." To turn the vessel a valve causes the water to be expelled at one side in the direction of the bows.

3. Vessels are to be ventilated by turning a fan constructed like the pump described above.

[Printed, 1*s.* 3*d.* Drawings. See Repertory of Arts, vol. 13 (*new series*), p. 78; Mechanics' Magazine, vol. 32, p. 156, also vol. 40, p. 90; Practical Mechanics' Journal, vol. 3, pp. 71, 88, 110, and 258; also vol. 4, p. 17; Inventors' Advocate, vol. 1, p. 115.]

A.D. 1839, March 26.—N° 8015.

ROWLEY, Edmund Butler.—Rotary steam engines. Improvements on an invention patented by the same patentee, December 19, 1837, N° 7513. (This Patent does not refer to marine propulsion). A piston-wheel revolving in a circular case has projecting slides protruded and withdrawn by pins moving in guides and curved grooves.

[Printed, 9*d.* Drawings. See Mechanics' Magazine, vol. 29, p. 321, also vol. 37, p. 193; Inventors' Advocate, vol. 1, p. 115.]

A.D. 1839, April 23.—N° 8046.

MOVILLON, Antonio.—A crank moves a beam vibrating on bearings at one end, and furnished with duck-feet collapsing paddles at the other. Another similar beam is connected at the lower end with the paddles by two rods, so that the hinged propeller will be expanded or folded up (for the return stroke) as the end of the second beam approaches or recedes from the first beam which is worked by a crank. This movement is produced by a grooved cam on the connecting rod working a pin on the second beam, or by a lever connecting the two beams.

The whole framing of the apparatus may be made moveable, so as to be adjusted to an oblique action for cross currents or winds.

[Printed, 6*d.* Drawings. See London Journal (*Newton's*), vol. 16 (*conjoined series*), p. 33; Inventors' Advocate, vol. 1, p. 179.]

A.D. 1839, April 23.—N° 8047.

PALMER, George Holworthy.—Feathering paddles. A paddle-wheel revolves in an air-tight compartment within a vessel open below to the water, which may be kept at a lower level than that outside by pumping in air.

The paddle shaft is horizontal, and passes through a stuffing-box at one side, beyond which it is connected with the machinery to turn it. The other end of the shaft turns in a bearing supported by a vertical arm fixed at right angles to a horizontal fixed shaft above it, and projecting a short distance inside the air-tight case. On this shaft as a centre a wheel turns having at the end of each arm a hole which receives the end of a small crank on the horizontal spindle carrying a float-board free to turn in the circular sides of the paddle-wheel. The guide-wheel on the short fixed shaft turns round as the paddle-wheel revolves, but it is excentric to the mainshaft, and therefore feathers the floats. The guide-wheel may be drawn back on its shaft, and thus set free the spindles of the floats, which will then turn in the water if the vessel sails so as to be placed edgeways.

[Printed, 7*d*. Drawings. See London Journal (*Newton's*), vol. 17 (*conjoined series*), p. 364; Inventors' Advocate, vol. 1, p. 179.]

A.D. 1839, May 7.—N° 8060.

MAUDSLAY, Joseph, and FIELD, Joshua.—1. A marine steam-engine has two equal cylinders fore and aft side by side. The pistons carry a crosss-head with a longitudinal opening along its middle, so as to allow the working of the connecting-rod from the crank above to a slider moving up and down between the cylinders in guides on the outside of each of them. The cross-head is fixed to the slider below by four vertical bars.

2. A cylinder with two piston-rods which carry a cross-head above the main-shaft, which is worked by a connecting-rod from the cross-head.

3. For working the expansion valves a tube slides on the main-shaft and turns with it. Cams in a spiral form are carried on the tube and work the valves by raising and lowering rods whose ends travel on the cams. The tube has a milled part taking into a toothed wheel, and as this wheel is turned by levers the tube slides right or left on the shaft, and presents different parts of the cam spiral, so as to increase or diminish the amount of expansive lead.

4. Flat plates and angle iron for beams and framing.

(This Patent is referred to in the Specification of a Patent in A.D. 1841, N° 8881, see *post*, p. 160.

[Printed, 2*s*. 8*d*. Drawings. See London Journal (*Newton's*), vol. 17 (*conjoined series*), p. 1; Engineers' and Architects' Journal, vol. 3, pp. 73 and 157; Inventors' Advocate, vol. 1, p. 227.]

A.D. 1839, June 17.—N° 8111.

ZANDER, HENRIK.—1. The paddle-shaft carries a wheel composed of three rims set with cogs, so that those on each are in advance of the others. The engine-shaft is above the paddle-shaft, and turns it by a wheel of a similar kind, which will act as if its pitch of teeth were two or three times less. The connecting-rod is in two pieces, or has an opening to let it work round the paddle-shaft.

2. Improved steam-engines.

(Some parts of the sentences between lines 25 and 35, page 11, appear to have been omitted by mistake. This Patent is referred to in the Specification of a Patent in A.D. 1842, N° 9516, see *post*, p. 172.)

[Printed, 1*s*. 1*d*. Drawings. See Repertory of Arts, vol. 14 (*new series*), p. 71; Inventors' Advocate, vol. 2, p. 19.]

A.D. 1839, July 6.—N° 8146.

ERICSSON, JOHN.—A half cylinder has a shaft along its axis carrying a slider or piston of a rectangular form which is caused to swing to and fro in the cylinder by steam admitted from, the boiler and discharged into the condenser. Two such cylinders, side by side, with their convex surfaces downwards, are used simultaneously by proper arrangements of slide valves and four-way valves, and their shafts are connected to a crank on the main-shaft below the cylinders.

[Printed, 1*s*. 3*d*. Drawings. See Mechanics' Magazine, vol. 32, p. 289; Inventors' Advocate, vol. 2, p. 132.]

A.D. 1839, July 13.—N° 8150.

WOODLEY, WILLIAM.—1. At each side of a vessel is a vertical shaft supported partly under water on bearings at a sufficient distance from the vessel's side to allow cross-arms at the top and bottom of the shaft to play. These cross-arms are furnished with vertical vanes hinged so as to open and close like the leaves of a book as the shaft is caused to vibrate through a small arc, and the cross-arm moves the propellers fore and aft.

2. Each float-board of a paddle-wheel is pierced with numerous holes in a diagonal direction, so that while "the float-board passing "through the water to propel will offer a surface equal in efficiency "to a solid float-board," the water will partly flow through the holes when the float-board is rising.

3. A vessel is propelled by a windmill, with leaves or shutters collapsing during the return stroke.

4. A cog-wheel, with the teeth inside the rim, turns another to increase the speed of the barrel of a capstan or a drum, to wind up a rope.

[Printed, 1*s.* 5*d.* Drawings. See London Journal (*Newton's*), vol. 15 (*conjoined series*), p. 372; Mechanics' Magazine, vol. 38, p. 379, also vol. 39, p. 338; Inventors' Advocate, vol. 2, p. 132.]

For description of the "Archimedes" steamer see Tredgold, Appendix D. pp. 14 & 18. An Act for forming and regulating a company to be called "The Ship Propeller Company," &c., (2 & 3 Vict. c. 93.) was passed in July, A.D. 1839.

A.D. 1839, August 16.—N° 8197.

ADAMS, WILLIAM BRIDGES, and BUCHANAN, JOHN.—1. Improvements in carriages, relating to wheels, springs, and lubrication, &c.

2. The parts of a paddle-wheel are connected by steel spring spokes, by which the motion is communicated from the shaft to the floats. The usual arms at each side of the wheel are retained, but their bosses turn on the shaft so as to allow the whole of the rim to play as the springs yield to the various pressures on the floats.

3. The engines in a vessel are suspended on springs.

[Printed, 1*s.* 9*d.* Drawings. See Mechanics' Magazine, vol. 32, p. 465; Inventors' Advocate, vol. 2, p. 163.]

A.D. 1839, August 23.—N° 8204.

COLES, WILLIAM.—1. The paddle-shaft is mounted on friction wheels fixed to the sides of the vessel near the gunwale or outside, or between the cranks inside. In this latter case the friction wheel shaft revolves on other friction wheels, the weight of the paddle-shaft and other wheels being finally cast upon the keelson timbers.

2. Railway carriages.

[Printed, 8*d.* Drawings. See Practical Mechanics' Journal, vol. 2, p. 213; Patent Journal, vol. 3, p. 194, also vol. 5, p. 418; Inventors' Advocate. vol. 2, p. 179; Engineers' and Architects' Journal, vol. 1, pp. 226 and 407, also vol. 4, p. 111.]

A.D. 1839, August 26.—N° 8207.

PINKUS, Henry.—Atmospheric and pneumatic gas engines are worked by air or gas conveyed through tubes under ground to stationary or locomotive engines in fields and on common roads or railways.

The gas is admitted into a chamber and then exploded, so as to increase its volume for a moment, during which its expansive force is applied as steam is in a steam-engine.

For propelling vessels on canals (see Specification, p. 17) a railway is laid down alongside the water, and the boats are towed by an engine on the railway worked by the means already mentioned. The air or gas is communicated to this engine through a longitudinal valve in a tube laid down along the railway. The valve is kept air-tight by cement melted by electricity.

(The Patent is referred to in the Specification of a Patent in A.D. 1840, N° 8644. See *post*, p. 156.)

[Printed, 4s. 2*d*. Drawings. See Inventors' Advocate, vol. 2, p. 195.]

A.D. 1839, September 19.—N° 8223.

TODD, Thomas.—Feathering paddles. Each float-board turns on horizontal axes and is of a flat, curved, or zigzag section. The lower edge is so weighted as to keep the float vertical during its passage through the water.

[Printed, 5*d*. Drawings. See Repertory of Arts, vol. 13 (*new series*), p. 256 London Journal (*Newton's*), vol. 16 (*conjoined series*), p. 145.]

A.D. 1839, October 7.—N° 8233.

HALL, Samuel.—1. Reefing paddles. Each float slides on the arms by means of boxes with curved springs, and a rod from the float lies along the arm, furnished with a catch which takes into a spiral groove on a wheel turning on the paddle-shaft. Another similar grooved spiral turns near the other end of the shaft, and a hollow shaft connects them, so that when the spirals turn together, the grooves will draw back or protrude the rods and the floats attached to them.

In order to move the two grooved wheels together when the paddle-wheel is in motion, a toothed wheel is fixed outside one of the circular sides of the paddle-wheel, and turns a small wheel on a horizontal shaft passing between two of the spokes. On this shaft is a toothed wheel turning a toothed rim on one of the grooved wheels, and thus, by stopping the first-mentioned toothed wheel while the paddle-wheel is moving, or vice versâ, the grooved wheel will be turned.

2. To disconnect a shaft from the paddle-wheel the pin joining two angled arms of the crank is made moveable and is unscrewed.

[Printed, 9*d*. Drawings. See Repertory of Arts, vol. 13 (*new series*), p. 259; Mechanics' Magazine, vol. 32, p. 252; Inventors' Advocate, vol. 2, p. 243.]

A.D. 1839, October 10.—Nº 8236.

HUMPHREYS, John Barnett.—1. Various improvements in the construction of vessels relating to their decks, rudders, hulls, and sliding keels, &c.

2. " Combining in the same vessel the effect of the keels with " the propelling power of the steam-engine." The improved sliding keel and improved rudder are to be used in bad weather when the vessel has to be propelled against a head sea.

[Printed, 10*d*. Drawings. See Inventors' Advocate, vol. 2, p. 260.]

A.D. 1839, October 10.—Nº 8238.

SMITH, James.—1. Locks on canals have their gates made moveable up and down, so that the canal-boat furnished with a long inclined temporary bow may be hauled on and over a roller on the top of the gate, and thus enter the higher level by depressing the gate. The rise should not be more than one foot for each lock, and the gate should be so contracted as to fit the boat nearly.

2. A large wheel rolling on the bottom of a canal or river is turned on a shaft on board a boat, and thus propels the boat by its bite or hold on the bottom. The engine turns a stationary shaft, which, by proper connexion, works a shaft carrying the large wheel, and moving up and down within certain limits as the wheel meets inequalities at the bottom of the water.

[Printed, 10*d*. Drawings. See Repertory of Arts, vol. 14 (*new series*), p. 148; Inventors' Advocate, vol. 2, p. 243.]

A.D. 1839, November 7.—Nº 8259.

MURDOCK, James.—Disconnecting paddle-shafts.—1. One of the crank-arms is cut off near the crank-pin in a slanting direction, and the cut part is hollowed so as to form part of a frustrum of a hollow cone.

The engine-shaft has at the end a drum with a moveable conical rim revolving close to the cut end of the crank, and when these two conical surfaces are forced up against each other, the shaft and crank move together.

The conical rim is moved back and forward by four screws, each of which has a toothed wheel gearing into a toothed rim, by which the screws may be turned either way.

2. A similar arrangement, but the conical part is moved by a spiral or screw groove on the shaft and projecting pieces on the drum, which travel along the groove, so that the conical part is screwed one way or the other on the engine-shaft.

3. A pall on the crank-pin connects itself with one or another notch in the end of the shaft and is moved by a cam.

4. The keys of the crank-pin are moved out or in by cams on the engine-shaft working alternately by a toothed wheel gearing into wheels on the cam axles.

[Printed, 7*d*. Drawings. See Inventors' Advocate, vol. 2, p. 307.]

A.D. 1839, November 19.—N° 8274.

STEVENS, Francis Worrell.—The floats of paddle-wheels are set at an angle on angle arms, so that when under water the inner edge of each float is towards the stern, and the plane forms an angle of about 35° with the keel.

[Printed, 11*d*. Drawings. See Repertory of Arts, vol. 18 (*new series*) p. 20; Inventors' Advocate, vol. 2, p. 356.]

A.D. 1839, November 23.—N° 8280.

HUNT, John.—A screw propeller is worked so as to steer the vessel. The propeller is on a short shaft, turning in bearings, fixed to a vertical case like a strong tube, supported by a bearing on the keel, and by another above water.

The propeller-shaft has a crown-wheel worked by a wheel on a vertical shaft in the centre of the case inside, and having another crown-wheel at its upper end, turned by a wheel on the engine-shaft.

The case may be turned to the right or left by a toothed sector on its upper part, worked by a toothed wheel, moved by a steering wheel, and thus the propeller is always in gear with the engine, while the direction of its axis may be altered by turning the case to the right or left.

[Printed, 9*d*. Drawings. See Mechanics' Magazine, vol. 32, pp. 175 and 285, also vol. 33, p. 33; Inventors' Advocate, vol. 2, p. 340; Appendix D. to Tredgold, p. 54.]

A.D. 1839, November 26.—N° 8286.

RENNIE, George. — 1. Paddle-floats. The floats are of a trapezoidal form "in which the diagonals are in the proportion to " one another of one to one and a half." The greater diagonal is in the direction of a radius from the centre of the wheel. Their surfaces may be plain, convex, or concave.

2. A screw propeller. "It consists of two or more curvilineal " leaves or plyers formed as follows, and attached to an axis. The " curves of which the leaves or plyers should be formed are obtained " by the descent of a tracer down the surface of a cone or conoid " caused to revolve on its axis. Curves so obtained have a con- " stantly varying inclination with their axis." A form of cone is preferred "such that its abscissæ shall increase or diminish in " arithmetical progression, while its ordinates increase or diminish " in geometrical progression."

[Printed, 5*d*. Drawings. See Repertory of Arts, vol. 14 (*new series*), p. 26; Inventors' Advocate, vol. 2, p. 355; Engineers' and Architects' Journal, vol. 12, p. 259.]

In A.D. 1839 a Patent was granted to B. D. Beecher in America for employing two screws set in the cut-water (*a*).

A.D. 1840, February 8.—N° 8377.

TAYLER, Joseph Needham.—1. Inside the paddle-box is fitted a 'shield' or part of a strong cylinder clear of the floats, and borne on the paddle-shaft by arms not fixed to the shaft.

The shield may be lowered by cog-wheels and chains so as to cover one wheel when the other is moving, or to protect both wheels when the vessel is at anchor or it may be lowered astern of them when she is scudding.

2. A chain on the paddle-shaft is led to wheels which turn the capstan or windlass. The paddle-wheels may be disconnected by throwing out of gear a strong clutch which allows the shaft to work the windlass and not the wheels.

[Printed, 9*d*. Drawings. See London Journal (*Newton's*), vol. 21 (*conjoined series*), p. 347; Inventors' Advocate, vol. 3, p. 114.]

(*a*) Bourne on the Screw Propeller, London, 1855, p. 37.

A.D. 1840, March 17.—N° 8436.

SEAWARD, Samuel.—1. "The first of my said improvements "consists in attaching to the piston of the steam cylinder two arms, "which project through the sides of the cylinder, and work up and "down therein through steam and air tight grooves, and in convey-"ing by means of a connecting rod, attached or jointed to the said "arms, the motion of the piston directly to the beam or cranks of "an engine without the intervention as usual of a piston rod and "parallel motion, or any similar contrivance."

2. The engine shaft turns the paddle shaft parallel to it by driving pinions. These are of different sizes, which may be thrown into gear as various relative velocities are required.

3. The piston may be expanded in the direction of the axis of the cylinder by a screw, and thus the length of the stroke may be altered without loss of steam.

4. Two cranks, "one called the main or driving crank, having a "sliding crank pin, and the other called the driven crank, having "oblong collars with parallel sides for the reception of the said "sliding pin, whereby I am enabled to alter at pleasure the throw "of the main or driving crank, and to disconnect entirely the one "crank from the other whenever that is found advisable."

5. "The method of connecting and disconnecting two cranks by "attaching a strong slide and jaw to the driven crank, with a screw "to move it backwards or forwards, so that according as the screw "is turned to the one side or the other, the pin of the driving "crank is either held firm within the jaw of the slide or liberated "from it, and the two cranks left free to revolve independently "the one of the other."

6. The cranks may be connected by a circular moveable head on the end of the driven crank, having a recess like a groove forming an arc of a circle into which is received the toe of the crank pin of the driving crank, so that by turning the head and altering the direction of this recess the crank pin is held fast or left free.

[Printed, 1*s*. 2*d*. Drawings. See Mechanics' Magazine, vol. 33, pp. 289, 321, and 401; Inventors' Advocate, vol. 3, p. 212.]

A.D. 1840, June 2.—N° 8530.

EAGLES, Samuel Salisbury.—1. A horizontal steam cylinder has the piston rod projecting, prolonged, and carrying a piston in another cylinder in the stern of a vessel, one end of this cylinder being open to the water, so that the piston acts directly against the water to propel the vessel.

Two similar engines are set side by side, and their motion is caused to be alternate by racks on the piston rods taking into a toothed wheel between them.

2. Locomotives on land.

[Printed, 6*d*. Drawings. See London Journal (*Newton's*), vol. 20 (*conjoined series*), p. 196; Mechanics' Magazine, vol. 34, p. 75; Inventors' Advocate, vol. 4, p. 36.]

A.D. 1840, June 11.—N° 8542.

WINKLES, Benjamin.—1. Feathering paddles. Each float turns on a horizontal axis, and is feathered by motion communicated to an arm projecting from the spindle. The arm travels along an excentric guide in the paddle-box until the edge of the float catches in a spring catch, which retains it nearly vertical until the effective part of its stroke in the water is done. The spring catch is then released by a cam, and the float falls back by the action of the water upon the rim of the wheel which its surface is formed to correspond with.

In another form the catch is dispensed with. The projecting arm must be jointed to the float, so as to remain at right angles when acting one way upon the water, but to turn round if the paddle-wheel is turned astern, and the excentric guide is continued to the lowest part of the wheel.

In another form the arm is rigidly connected to the float, and the excentric guide is extended below the paddle-shaft, so as to direct the float until it reaches the lowest point. The catch is not used, and the lower part of the excentric guide is moveable by a rod under the engineer's command, so as to be properly placed when the wheels are turned astern.

2. Water-wheel floats.

[Printed, 2*s*. Drawings. See Mechanics' Magazine, vol. 33, p. 589; Inventors' Advocate, vol. 4, p. 35.]

A.D. 1840, June 13.—N° 8544.

COATES, Ezra Jenks.—An endless chain passes over a pulley at each end of a boat, and the lower part drops down so as to lie upon the bottom of the canal, which it holds either by its weight or by small anchors in addition. The pulley at one end is moved by an engine, and thus the boat is drawn along the chain.

[Printed, 9*d*. Drawings. See Repertory of Arts, vol. 17 (*new series*), p. 291; Mechanics' Magazine, vol. 33, p. 592; Inventors' Advocate, vol. 4, p. 36.]

A.D. 1840, June 13.—N° 8545.

CARPENTER, Edward John.—Screw propellers.

1. A screw propeller is applied at each quarter on a shaft (with a universal joint) which may be raised by a rod.

2. Such a propeller may be used temporarily, and worked by toothed wheels driven by the capstan when it is required to steer the vessel or bring her round.

3. To enable a single propeller to work on a shaft passing through the stern-post the rudder is in two parts, joined by a loop-like piece within which the shaft of the propeller works while the rudder may be turned right and left.

[Printed, 6½*d*. Drawings. See London Journal (*Newton's*), vol. 20 (*conjoined series*), p. 332, and vol. 44 (*conjoined series*), p. 382; Mechanics' Magazine, vol. 33, p. 608, vol. 34, p. 257, vol. 49, p. 222, and vol. 60, p. 345; Inventors' Advocate, vol. 4, p. 20; Engineers' and Architects' Journal vol. 4, pp. 56 and 158.]

A.D. 1840, August 7.—N° 8593.

TREWHITT, Henry.—Disconnecting paddle-shafts. One arm or side of the crank of the paddle-shaft consists of a cylinder fixed on the shaft. The bearing for the crank pin is attached to this cylinder by a circular strap, so that while the strap is tightened by cutters the movements of the cylinder and of the other arm of the crank are simultaneous; but when the strap is loosened the crank bearing may be turned round on the cylinder, and that part of the shaft carrying the cylinder will not move.

[Printed, 6*d*. Drawings. See Repertory of Arts, vol. 15 (*new series*), p. 334; Mechanics' Magazine, vol. 34, p. 189; Inventors' Advocate, vol. 4, p. 100; Engineers' and Architects' Journal, vol. 4, p. 124, and vol. 5. p. 116.]

A.D. 1840, August 14.—N° 8603.

BERRY, Miles.—1. Screw propellers. There are two propellers' shafts inclined to each other at the vessel's bows. The vanes are right and left handed screws, so as to draw the water out of the line of the vessel's motion. The vessel's bottom may be carried forward under the propellers. The bows are to be shaped to admit the apparatus.

2. Paddle-wheels may be placed with their shafts horizontal, and making an obtuse angle with each other.

[Printed, 5*d.* Drawings. See Repertory of Arts, vol. 15 (*new series*), p. 289; London Journal (*Newton's*), vol. 19 (*conjoined series*), p. 268; Mechanics' Magazine, vol. 34, p. 174; Inventors' Advocate, vol. 4, p. 117.]

A.D. 1840, September 17.—N° 8632.

FOUDRINIER, GEORGE HENRY, and FOUDRINIER, EDWARD NEWMAN.—1. Steam-engines. Two pistons move in the same cylinder by the same steam and turning the same shaft. Their piston rods are at opposite ends of the cylinder, and connected with cranks which are at opposite sides of the shaft.

By putting a partition in the cylinder the pistons work the same shaft by cranks at right angles to each other.

2. Air is forced through tubes under the bottom of a vessel so as to propel her.

[Printed, 1*s.* Drawings. See Repertory of Arts, vol. 15 (*new series*), p. 354; London Journal (*Newton's*), vol. 19 (*conjoined series*), p. 163; Mechanics' Magazine, vol. 34, p. 250; Inventors' Advocate, vol. 4, p. 199; Engineers' and Architects' Journal, vol. 4, p. 206.]

A.D. 1840, September 21.—N° 8636.

MILL, WILLIAM. — 1. Reciprocating propellers with feathering vanes are fixed in arms proceeding from a horizontal wheel in a water-tight case within a vessel. The arms and vanes project into the water and are immersed. They are moved through part of a circle and feathered (for the return stroke) by ropes, acting through a hollow vertical shaft, and by pinions and rack-work. The propeller in one form is like an oar with a sculling motion imparted to it.

2. Steam engines with stationary piston and moveable cylinders.

3. Safety valve.

4. A wheel lock, and a combination of wheels.

[Printed, 1*s.* 8*d.* Drawings. See Mechanics' Magazine, vol. 34, p. 305; Inventors' Advocate, vol. 4, p. 197.]

A.D. 1840, September 24.—N° 8644.

PINKUS, HENRY.—1. Atmospheric and pneumatic gas apparatus are described for railways, agricultural implements, and fire-engines.

2. For propelling vessels on canals (see p. 7) a railway is constructed alongside with one rail, on which a suitable carriage traverses. A tube conveys gas along the rail from a stationary engine and reservoir. The gas is brought through a longitudinal valve on the rail-tube to a flexible tube from the carriage to a reservoir on board the vessel, and thus machinery is turned, which again, by an endless band, turns two horizontal wheels, one on each side of the rail on shore, and carried on the carriage before mentioned. These wheels, by revolving, draw the carriage forward, and with it the vessel attached.

3. In another plan (p. 10) a steam-engine on a vessel turns a horizontal wheel, which, by an endless band, turns on shore a pair of horizontal wheels similar to those already described, and those by revolving tow the vessel on. The carriage holding these wheels has a curved guard over it formed like the rail itself on which the carriage runs. This is to enable another carriage meeting it to pass over the first, and thus two vessels may pass each other, being towed in opposite directions by their carriages travelling on the same rail.

4. Electric currents are led along wires to work agricultural implements, or railway machinery, or railway brakes.

5. For propulsion of vessels on water (p. 17) the single rail and carriage with horizontal wheels described above are used. The wheels are moved by an endless band from a wheel on board the vessel, turned by an electro-magnetic engine actuated by electric currents led to the vessel through wires from the carriage on shore, and which again communicate by wires along the rail with a stationary battery.

6. Electrical currents or influence for illumination.

(The Patent is referred to in a Patent, in A.D. 1843, Nº 9835; see *post*, p. 178. Reference is made (under a wrong date) to a Patent, in A.D. 1839, Nº 8207; see *ante*, p. 149.)

[Printed, 6*s*. 8*d*. Drawings. See Mechanics' Magazine, vol. 34, p. 299; Inventors' Advocate, vol. 4, p. 213; Engineers' and Architects' Journal, vol. 4, p. 174.]

A.D. 1840, November 2.—Nº 8671.

WIMSHURST, Henry.—The stern deadwood of a vessel is strengthened for receiving a screw-propeller (which may be unshipped) by plates on the keel, and angular stems or bars, one forward and the other aft, which fit into recesses in metal braces on the stern-post and bearing-post. The propeller has its bearings near the lower ends of these moveable stems, and their upper ends are secured above.

When the propeller is to be unshipped the stems are withdrawn (as a rudder with pintles is unshipped), the propeller shaft is detached by undoing a coupling, and the propeller is slung out of the way, the stems being lowered by directing their upper ends. The shaft is driven by a cog-wheel, turned by one on each side, in conjunction with straps moved by the engine cranks.

(The lower letters E E in the drawing are probably meant to be F F.)

[Printed, 7*d*. Drawings. See Mechanics' Magazine, vol. 34, p. 382.]

A.D. 1840, November 3.—N° 8678.

RAPSON, John.—"Constructing paddle-wheels by applying "hollow vessels in place of the float-boards heretofore used."

[Printed, 5*d*. Drawings. See Repertory of Arts, vol. 16 (*new series*), p. 38; Mechanics' Magazine, vol. 34, p. 384; Inventors' Advocate, vol. 4, p. 308.]

A.D. 1840, November 25.—N° 8714.

DAUBENY, Henry Charles.—Feathering paddles. Each float is on a spindle set as an arm of the wheel, and it is caused to feather as the wheel revolves by the action of traverses or guides and projecting pieces.

The paddle-shaft may be inclined with its inner part downwards so as to hide the upper part of the wheel.

A second similar paddle-wheel may revolve outside of and on the same axis with the first, which should turn more slowly than that outside.

Curved floats feathered in this way should be turned one quarter round and back again.

By a Memorandum of Alteration, dated February 4, 1842, the patentee says the "invention or improvement is equally applicable "to the present form of paddle-wheels, or to wheels with horizontal floats, as to wheels with vertical floats as described in my "said Specification."

[Printed, 10*d*. Drawings. See Mechanics' Magazine, vol. 34, p. 446; Inventors' Advocate, vol. 4, p. 357; Engineers' and Architects' Journal, vol. 4, p. 234.]

A.D. 1840, November 28.—N° 8729.

BLAXLAND, George.—Screw propeller. The shaft has a bearing in a post forward of the stern-post, and no bearing in the stern-post. The bearing may be shaped to allow the shaft, at that point, to have a spherical part, so that the inner end of the shaft may rise and fall. In this case a conical piece, ground into the inner part of the bearing, is kept to it by a spring.

The shaft is worked by a drum, intermediate between a drum on the shaft and one on the engine shaft. The drums work by friction, or by bands, or by both combined. The band may be tightened by a screw. The engine-shaft may also be moved to tighten the hold of its drum. The vanes in the propeller arms are inclined planes in one or more pieces. A geometrical diagram is given for determining the form of each plane.

[Printed, 8*d*. Drawings. See Mechanics' Magazine, vol. 35, p. 209, and vol. 36, p. 449; Inventors' Advocate, vol. 4, p. 84.]

A.D. 1841, January 21.—N° 8805.

MELVILLE, John. A horizontal shaft across a vessel has a crank outside, which moves a bar with a broad vane upon it acting on the water. The vane is raised out of the water by the crank for the return stroke.

The upper part of the bar is guided by a rod jointed to it and to a fixed point, so that the vane "describes a curve which differs "but little from the segment of an ellipse."

The upper part of the bar may be guided by two friction rollers on a vertical bar, or by one roller working in a slot in the upper part of the bar.

(Reference is made to a Patent in A.D. 1838, N° 7562. See *ante*, p. 135.)

[Printed, 9*d*. Drawings. See Mechanics' Magazine, vol. 35, p. 142.]

A.D. 1841, February 15.—N° 8845.

WHITELAW, James, and WHITELAW, George.—1. Air, gas, or smoke, or any fluid lighter than water, is discharged under the water from apertures near the keel of a vessel, and along channels open below, and leading it towards the stern.

The air is forced out by a pump formed of vanes on a shaft in a cylinder. The shaft turns half round and back again, and draws in and expels the air by valves properly arranged. The concussion at the end of the stroke is lessened by the action of the vane being expended on compressed air.

The air is to be expelled under the vessel at intervals, so as to retard its discharge. The vessel is moved astern by stopping the action of one set of valves, and forcing water through a tube turned to the bow.

2. A steam engine, constructed somewhat like the force-pump, with vanes moving back and forward in a cylinder.

[Printed, 1*s*. 3*d*. Drawings. See Mechanics' Magazine, vol. 35, p. 260; Inventors' Advocate, vol. 5, p. 118.]

A.D. 1841, March 16.—N° 8881.

MAUDSLAY, Joseph.—A steam engine cylinder has an internal concentric cylinder, open at both ends, but united to the top and bottom covers of the first cylinder, so that the space between the two cylinders is steam-tight.

An annular piston works in this space with two piston-rods, one on each side, fixed to the ends of a T-shaped crosshead, the middle limb or part of which moves in and out of the inner cylinder, and is jointed at its end to the connecting rod that turns the crank on the paddle-shaft.

The crosshead may be double, so as to admit the connecting rod between its parts, or the connecting rod may be forked, and one part be placed on each side of the middle limb of the T-shaped crosshead, which limb moves on guides in the inner cylinder.

(Reference is made to a Patent in A.D. 1839, N° 8060. See *ante*, p. 146.)

[Printed, 10*d*. Drawings. See Repertory of Arts, vol. 17 (*new series*), p. 321; London Journal (*Newton's*), vol. 20 (*conjoined series*), p. 1; Mechanics' Magazine, vol. 35, p. 287, vol. 36, p. 145, and vol. 39, p. 177; Inventors' Advocate, vol. 5, p. 197; Engineers' and Architects' Journal, vol. 4, p. 369.]

A.D. 1841, March 22.—N° 8888.

FIELD, Joshua.—Disconnecting paddle-wheels. Each wheel, together with that part of the shaft connected with it as far as the joint of the crank-pin, is caused to move horizontally to or from the crank-pin, and so to be connected or disconnected from the rest of the shaft.

The bearings of the moveable shaft have their lower brasses fixed and shorter than the distance between the shoulders on the shaft, so that it may be moved along the lower bearings. The upper brasses are moveable with the shaft, and they are longer, so as to fit between the shoulders.

When an excentric or cam moves the upper brasses horizontally, they will move the shaft and paddle-wheel. A cogged rim on the wheel allows it to be turned round, so as to adjust the shaft and the crank-pin.

[Printed, 11*d*. Drawings. See Repertory of Arts, vol. 17 (*new series*), p. 270; London Journal (*Newton's*), vol. 20 (*conjoined series*), p. 5; Mechanics' Magazine, vol. 35, p. 303; Inventors' Advocate, vol. 5, p. 214.]

A.D. 1841, March 22.—N° 8893.

NAPIER, David.—1. Screw propellers. "Two wheels or pro- "pellers of equal diameter at a vessel's stern, the axes of both to "be above the level of the water, and one wheel further aft than the "other, so as to admit the blades or float-boards of one wheel to "work nearly up to the axle of the other wheel."

The shafts are horizontal.

2. Feathering paddles. Each float turns on a horizontal spindle, the crooked end of which turns in the arm of a wheel without a centre shaft, and which hangs on the spindle cranks excentric to the paddle-wheel, so as by its weight to cause the floats to feather in passing through the water.

[Printed, 6*d*. Drawings. See Repertory of Arts, vol. 17 (*new series*), p. 355; London Journal (*Newton's*), vol. 20 (*conjoined series*), p. 268; Mechanics' Magazine, vol. 35, p. 300; Inventors' Advocate, vol. 5, p. 213.]

A.D. 1841, March 25.—N° 8901.

FINCH, Edward.—At the end of a horizontal shaft, across a vessel, are fixed two "propellers" or floats, the plane surfaces of which are inclined to the axis of the shaft. They are so placed that when the propeller is in the water, at the middle of its effective stroke, the crank is at its best working position with respect to the engine.

[Printed, 1*s*. Drawings. See Repertory of Arts, vol. 16 (*new series*), p. 351; Mechanics' Magazine, vol. 35, p. 304; Inventors', Advocate vol. 5, p. 213.]

A.D. 1841, May 25.—N° 8969.

WHITEHOUSE, John.—"An improved mode of making boilers "to be used in marine steam engines." "Forming steam boilers "for marine steam engines, each in two compartments one above the "other, both compartments having a steam chest or chamber in "which the steam is received; at the same time, the steam chest or "chamber is so arranged as to be separated from either of the two "compartments when from any cause either of the two compartments "of which the boiler is composed may be required to be put out of "work; and the two sets of furnaces for the respective compartments "have their separate flues, the two compartments being independent "of each other in respect to the water spaces."

[Printed, 1*s.* 3*d.* Drawings. See Repertory of Arts, vol. 17 (*new series*), p. 77; Mechanics' Magazine, vol. 35, p. 448; Inventors' Advocate, vol. 5, p. 356.]

A.D. 1841, May 26.—N° 8970.

JOEST, William.— Propellers. 1. "The double fishes tail," "composed of a prismatical hollow solid," is a bent vane on a vertical axis which revolves under water. The vane turns partly round on a second vertical spindle, and is governed by chains. The action is like that of a submerged paddle-wheel with a yielding motion in the floats.

2. "The syphon screw" is a propeller with blades round a hollow shaft. Various forms are shown, and some of them represent the alternate vanes or blades smaller than the others.

3. "The paddle-wheel with double indented or tooth floats or "paddles." The floats are indented at the outer edges each alternate float in a toothed or crenellated form. These paddles may be used vertically or horizontally with a rapid motion.

(The figure marked Fig. 1. at the lower left-hand corner of the sheet of drawings seems to be that referred to at p. 2, line 3, of the printed Specification. There is another figure marked Fig. 1. near the centre of the right-hand side of the sheet. There is no mention of Fig. 11. in the description.)

[Printed, 1*s.* 1*d.* Drawings. See Mechanics' Magazine, vol. 35, p. 385.]

A.D. 1841, June 10.—N° 8981.

BODMER, John George.—1. A propeller. A drum with vanes revolves in a case on an axis nearly vertical, and expels water (received at its centre) through channels with a fore and aft direction opening under water at the side of a vessel. The revolvin apparatus is conical, with the smaller end downwards; and the case may be so far within the vessel as to allow the channels admittin and discharging the water, to be governed by valves for turning ahead or backing astern. Or the drum may revolve so near the vessel's side as to allow the vanes to receive and discharge the water without any long channel.

The shafts of two such drums are turned by cog-wheels on two other shafts (also inclined to the horizon) turned by horizontal steam engines, and the last-mentioned wheels gear into each other, so that the wheels all move simultaneously, the operations of backing, stopping, and steering being performed by governing the discharge pipes of the propellers while the engines are still in motion.

2. Each of the steam engines has a steam cylinder with two pistons working in opposite directions, and turning separate cranks on the shaft by separate piston rods, one moving in the other (which is hollow). An "expansion cylinder" is attached to the other, so that the amount of steam can be regulated for each stroke by passing it through this cylinder before it works the engine by the other cylinder.

3. Another form of steam engine, in which the piston and piston-rod are fixed, and the cylinder moves along them communicating its motion to the crank by a connecting rod on each side on a lug projecting from the cylinder. The piston-rod is hollow, and is continued through and beyond the piston, and passes through stuffing-boxes on each of the cylinder-head covers. The steam enters the cylinder by one end of the hollow piston rod and escapes to the condenser by the other end. The induction and eduction valves are in the middle of the piston, and the crank shaft passes through the end of the hollow piston rod.

4. Moveable paddle-wheels. In order to raise and lower the wheels, each wheel is on a paddle-shaft with a frame-work supporting an inner rim of cogs concentric with the shaft and driven by a cog-wheel on the engine-shaft. The paddle-shaft, connected with the arms and floats as usual, is hollow, and has another within it carrying a

cog-wheel at one end, taking into a toothed sector so placed that when this last wheel is caused to move along the sector the axis of the paddle-shaft will rise or fall, but its gearing with the engine-shaft will not be thrown out. The wheel working in the sector is moved by a large snail cog-wheel at one end of its shaft, taking into a screw turned by hand.

In another form, instead of requiring a shaft within the paddle-shaft, the simultaneous movement of the wheels travelling in sectors is obtained by a shaft outside the wheel altogether and parallel to the paddle-shaft.

In another form (Fig. 6), the method first described is modified by having a cog-wheel at each end of the shaft taking into a sector.

[The Patent is referred to in the Specification of a Patent in A.D. 1843, N° 9702. See *post*, p. 175. The following corrections appear to be necessary:—In p. 8, line 29, "bridle 6" should be "bridle *b*;" and in p. 9, line 6, instead of "described. With reference to figures 2 and 3," read "described with reference to figures 2 and 3." Reference is made to a Patent in A.D. 1834, in which year there were two granted on the same day, viz., N° 6616 (numbered 6617 by mistake in the printed Specifications), and N° 6617 (numbered 6616 by mistake in the printed Specification). Neither of these Patents refer specially to Marine Propulsion, but to steam engines generally.]

[Printed, 2*s*. 7*d*. Drawings.]

A.D. 1841, June 19.—N° 8994.

BROWN, SIR SAMUEL.—1. A locomotive steam engine moves on a railway or on a towing-path beside a canal by the action of three wheels, which drag it along a chain fixed at one end, or along an endless chain; the engine tows a vessel in the water.

2. A vessel drags itself along a chain by similar means.

[Printed, 1*s*. 4*d*. Drawings. See Mechanics' Magazine, vol. 36, p. 92.]

A.D. 1841, June 19.—N° 8995.

CAMPBELL, JOHN GEORGE TRUSCOTT.—"A whale-tail or fluke propeller." Two flap-like vanes, swinging fore and aft on horizontal axes, are so moved under water in an aperture through the dead-wood at a vessel's stern as to imitate the motion of the tail of a fish, when the broad surface is nearly vertical and across the direction of the fish's length. This is done by an arrangement of levers and jointed "knuckles," the action of which is explained by the drawings.

[Printed, 6*d*. Drawings. See Repertory of Arts, vol. 17 (*new series*), p. 226 Mechanics' Magazine, vol. 36, p. 45.]

A.D. 1841, July 28.—Nº 9038.

VON RATHEN, Anthony Bernhard.—Air is compressed by stationary forcing pumps into portable reservoirs formed of tubes. A reservoir charged with compressed air is carried on a locomotive for a railway, or on a vessel for propulsion on water. The air is conducted from the reservoir through a regulating apparatus to machinery like that of the steam-engine.

(This Patent is referred to in the Specification of a Patent in A.D. 1847, Nº 11,932. See *post*, p. 206.)

[Printed, 1*s*. 9*d*. Drawings. See Mechanics' Magazine, vol. 36, p. 156.]

A.D. 1841, August 4.—Nº 9040.

WILLIAMS, Owen.—1. A horizontal frame projecting from each side of a vessel carries the bearings for two hollow tubes, through each of which a bar is suspended, so as to move in it up and down, and to swing fore and aft on the bearings.

The lower end of each bar has a broad vane, and the upper end is moved by a crank or a shaft placed vertically over the frame.

The two vanes on the same side of the vessel work alternately in the water.

2. Broad vanes at the end of bars sliding up and down outside a vessel are moved by the action of the waves and rolling of the vessel, so as to work pumps or paddle-wheels.

[Printed, 11*d*. Drawings. See Repertory of Arts, vol. 18 (*new series*), p. 146; Mechanics' Magazine, vol. 36, p. 124.]

A.D. 1841, August 4.—Nº 9043.

JONES, Stopford Thomas.—Shafts across a vessel carry cranks outside moving rods, furnished at the lower ends with broad vanes dipping into the water, and acting in a fore and aft direction. Each rod is moved by two cranks, one of them working in a bearing at its upper end, which may be adjusted so as to cause the vane below to describe a proper path. Other levers, cranks, and swinging bars are so arranged as to cause the cranks and vanes to work in regular succession.

[Printed, 9*d*. Drawings. See Mechanics' Magazine, vol. 36, p. 125.]

On August 18, 1842, a notice was inserted in the "Great Northern Advertiser," Newcastle-upon-Tyne, relating to experiments with Martin's swan-foot paddle oar, and stating it had been suggested twenty years previously.

A.D. 1841, September 6.—N° 9068.

PELLETAN, Pierre.—The smoke and products of combustion from a furnace on board a vessel are caused to expand an elastic "sack," in a water channel along the bottom of a vessel, and thus to eject water and propel it.

[Printed, 1*s*. Drawings.]

A.D. 1841, September 17.—N° 9085.

STOLLMEYER, Conrad Frederick.—"Firstly, to effect all " the works for shifting the sails and other stated purposes by a " windmill at the stern of the vessel. Secondly, to simplify the " sail system by superseding all the ordinary sails, and substituting " in their stead a sort of fan, to be expanded or contracted to any " portion of its surface, and to be turned around a mast as on a " pivot into any position required, by means of connecting the " same with the windmill or other first mover. Thirdly, as the " windmill may produce any rotatory or linear motion, it may also be " applied to weigh anchors, lift goods on board, pump water, and " perform other operations. Fourthly, as the action of the waves " consist in alternate ascending and descending motions, any of " them and all around and below the vessels or float may be made " tending to a rotatory motion of one and the same continuous " way, and when this is once obtained, any kind of machine may " be driven by it for the purposes of propulsion of the vessel, " pumping out water, and any alteration in the expansion, contrac- " tion, or turning on the pivot of the sail or fan mentioned."

For these purposes various constructions are described of floats, chains, spindles, sails, and windmills connected with vessels.

[Printed, 2*s*. Drawings. See Inventors' Advocate, vol. 5, p. 330.]

A.D. 1841, September 29.—N° 9107.

MILLER, Joseph.—" My improved arrangement of certain parts " of steam-engines used for steam navigation, relates to a par- " ticular class or kind of such steam-engines wherein two steam " cylinders are disposed beneath the rotative axis of the cranks, " and suitable cap-pieces which are fastened on the upper ends of " the two piston-rods are jointed to the lower ends of two con- " necting rods, which rods are jointed at their upper ends to the " pins of the cranks in order to communicate a rotatory motion to " those cranks and to their axis in consequence of the alternate up " and down motion of each of the piston-rods being transmitted " by each of their respective connecting rods to the pins of the " cranks, so as to give rotatory motion to the cranks and to their " axis without intervention of other parts or joints than those of " the said connecting rods between the aforesaid cap-pieces of the " piston-rods and the pins of the cranks. The parts of steam- " engines of the aforesaid class or kind to which my said improved " arrangement and combination relates are the steam cylinders, " the air-pump, and the condensers." The condensers abut on each other, and occupy the space between the cylinders. The air-pumps are within the condensers.

[Printed, 1*s.* 10*d.* Drawings. See Mechanics' Magazine, vol. 36, p. 286; Engineers' and Architects' Journal, vol. 5, p. 177.]

A.D. 1841, November 9.—N° 9143.

DAVIES, Henry.—1. An upright shaft in a vessel carries a horizontal grooved wheel on which is an endless rope moving a drum on a carriage on shore, by which its wheels are turned so as to propel the carriage and tow the vessel along. The carriage is guided by a wheel in front directed by a man.

2. Feathering paddles. A submerged wheel has floats, each of which turns on a horizontal spindle connected by arms with an excentric wheel moved by gearing so as to feather the floats.

3. A carriage is moved by levers working legs against the ground.

[Printed, 2*s.* Drawings.]

A.D. 1841, December 16.—N° 9179.

MARX, Francis.—1. An arched iron ball-proof deck to protect a vessel.

2. On each side of a vessel a drum revolves under water on a vertical axis, and it is furnished with floats. To unship these a cylinder is attached above the case holding the drum and reaching above the water-line. The machinery in the water may thus be taken out through the upper cylinder.

3. The escape steam of a high-pressure engine is conducted to the upper part of a revolving propeller to be condensed under water.

[Printed, 10*d.* Drawings. See Repertory of Arts, vol. 18 (*new series*), p. 193; Mechanics' Magazine, vol. 37, p. 43.]

A.D. 1841, December 16.—N° 9184.

BOOTH, HENRY.—A double beam at each side of a vessel swings fore and aft on a horizontal axis, and carries below in the water a valve-float, which folds back on the return stroke.

The beam is worked by a bar from a beam swinging fore and aft between two cam-wheels, which are turned in the same direction by cranks from the engine. The depressions in the cams are so arranged that they push the beam (by a friction-wheel upon it) smartly back and forward during one part (about one-tenth) of the stroke, and the cams acquire impetus during the remaining part. In addition, there is a cylinder with a piston so connected with the bar and beam as to compress air gradually while the float is in the return stroke, and thus to accumulate power for an increased action on the valve-float in its effective action by the expansion of the air in the cylinder.

[Printed, 8*d.* Drawings. See London Journal (*Newton's*), vol. 25 (*conjoined series*), p. 18; Mechanics' Magazine, vol. 37, p. 49.]

A.D. 1841, December 16.—N° 9191.

LOOSEY, CHARLES.—1. A rotary engine with a cylinder, in which revolves an excentric drum, with "flyers" or pistons, adapting their positions to that of the cylinder and drum by joints and a sliding motion in spaces radiating from the centre of the drum. The flyers may be connected by a ring, which keeps their outside edges in a circle about the centre of the cylinder to diminish the friction on its interior.

2. A rotary pump on a similar plan.

3. Paddle-wheels. The floats move like the "flyers" in the preceding construction, and the cylinder is replaced in its lower

part by a ring so as to allow the floats to act on the water. The wheel may be submerged.

4. A steam-engine cylinder has two or more piston-rods, so as to allow the connecting rod to be attached to a cross-head, and to work down to a depression in the top of the cylinder-lid.

[Printed, 1*s.* 9*d.* Drawings.]

A.D. 1841, December 21.—N° 9206.

BURGE, William.—Two parallel endless chains, carrying floats between them, turn on vertical wheels placed one behind the other at a vessel's side. One of the wheels is smaller than the other. The floats hang freely on spindles, and their positions on entering and leaving the water are regulated by curved guides near the wheels.

[Printed, 9*d.* Drawings. Repertory of Arts, vol. 18 (*new series*), p. 80.]

A.D. 1842, January 11.—N° 9217.

CHATTERTON, Richard Dover.—Paddle-floats. "Instead "of these floats being placed parallel to the axis or shaft *B*, as "such floats are now usually placed, they are fixed obliquely at a "considerable angle thereto, and in alternate opposition to one "another, as shown in the said drawing, each float projecting "beyond that opposite to it." Other modifications are shown of sets of floats placed obliquely.

[Printed, 6*d.* Drawings. See Repertory of Arts, vol. 3 (*enlarged series*), p. 140; Mechanics' Magazine, vol. 37, p. 129, vol. 39, p. 303, and vol. 56, p. 61.]

A.D. 1842, February 8.—N° 9249.

BIRAM, Benjamin.—1. Vanes and floats of rotary machines and ventilators.

2. Screw propellers. Two propellers revolve in opposite directions side by side at the stern of a vessel. Each propeller consists of a set of oblique vanes attached to the axis by arms.

3. Paddle-wheels. Each float has two arms inclined to each other and united to the axis at different points on its length. The position of these arms resembles what would be seen if the inner part of the blade of a screw-propeller vane were cut away except the two edges.

The floats are further secured by two concentric rings, and each float has a side plate enclosing part of the side of the wheel between the concentric rings. The floats are thus placed diagonally across the wheels, and "the angle which the paddle makes with the side "of the wheel is constantly increasing from the extremity inwards."

[Printed, 10*d*. Drawings. See Mechanics' Magazine, vol. 37, pp. 321 and 366, vol. 40, p. 248, vol. 46, p. 121, and vol. 50, p. 1; Record of Patent Inventions, vol. 1, p. 13.]

A.D. 1842, March 14.—N° 9294.

FIRCHILD, Charles William.—Water is forced out at a vessel's stern by two pistons, acting alternately in horizontal chambers. The pistons "do not touch the cover of the chambers."

[Printed, 11*d*. Drawings. See Mechanics' Magazine, vol. 37, p. 475; Record of Patent Inventions, vol. 1, p. 132.]

A.D. 1842, May 11.—N° 9348.

MELVILLE, John.—Feathering paddles. Each float hangs freely on a horizontal axis through its centre. The outer part of the float is weighted, and the direction it assumes in turning round is regulated by a chain to the arm of the wheel or by stops.

[Printed, 6*d*. Drawings. See Mechanics' Magazine, vol. 37, p. 511; Record of Patent Inventions, vol. 1, p. 282.]

A.D. 1842, May 23.—N° 9354.

PILBROW, James.—1. A rotary steam-engine. Steam is directed during its expansion from a cylinder upon small oblique floats on the circumference of a wheel through tubes nearly in the directions of tangents.

2. The apparatus applied to a locomotive engine.

3. A sloping screen in front of a railway locomotive to lessen the resistance of the air and to use it to press the wheels on the rails.

4. An air-pump for marine engines, formed of a cylinder revolving excentrically within another furnished with ports to allow the entrance and discharge of the contents of the condenser.

5. A shaft set in motion by the rotary engine is linked by a crank with "a spring compensating link" (*see* p. 15) to another shaft revolving in bearings at the side of the vessel. The end of this last shaft projects through the vessel and has upon it a roller which takes into a groove in the rim of the paddle-wheel, and thus turns the paddle-wheel by the friction between the roller and the side of the groove on the rim by "the roller and wheel connection."

The shaft may be moved up or down vertically through a small space so as to bring the edge of the roller to bear on the upper or lower side of the groove, and thus to turn the paddle-wheel ahead or astern. The roller may be so grooved as to bite a wedge-shaped part of the groove by "the bevilled groove and spherical "tongue connection."

A treatise on the subject and tables of figures are added.

[Printed, 2*s.* 2*d.* Drawings. See Mechanics' Magazine, vol. 38, p. 239; Record of Patent Inventions, vol. 1, p. 300.]

A.D. 1842, June 21.—Nº 9398.

DICKSON, JOHN.—1. An endless chain over two wheels at a vessel's side carries circular floats, which pass through a horizontal tube open at both ends and under water, to propel the vessel.

2. Curved bucket-shaped paddle-floats.

3. A rotary steam-engine in which a piston revolves inside a cylinder furnished with abutments which recede to let it pass.

4. A rotary air-pump.

5. A tubular boiler with a moveable furnace.

[Printed, 10*d.* Drawings. See Record of Patent Inventions, vol. 1, p. 412.]

A.D. 1842, July 7.—Nº 9411.

BIRD, JOHN.—1. Rotary pump, in which revolving pistons slide out and in as they pass a curved abutment in a cylinder.

2. Paddle-wheel. Each float is moveable along the arms supporting it. An excentric rib (not lettered in the drawing) pushes the float gradually inwards as it leaves the water, and springs at the inner side force it outwards again before it enters the water.

3. Forcing and lifting pumps. The pistons are moved by a "lazy-tongs" apparatus, the end joints of which are worked by spiral grooves or screw threads on a shaft across the cylinder of the pump. In another form there are two pistons connected by rods, and worked by a revolving shaft passing through the centre of the cylinder from end to end and moving the pistons (together) up and down by screws in them which gear alternately on screws cut on the upper and lower part of the shaft.

4. Steam-engines in which a piston moves along a rod through the cylinder, and turns the rod by a screw.

[Printed, 1*s.* 4*d.* Drawings. See Mechanics' Magazine, vol. 38, p. 393; Record of Patent Inventions, vol. 1, p. 439.]

A.D. 1842, September 29.—N° 9478.

HENSON, William Samuel.—1. An aerial machine carrying a car and moved by steam.

2. A steam-engine and boiler which may be used for locomotion on water. The boiler is formed of conical-shaped tubes of different lengths suspended from a steam-chest over the furnace.

[Printed, 3*s.* 11*d.* Drawings. See Repertory of Arts, vol. 1 (*enlarged series*), p. 257; Mechanics' Magazine, vol. 38, pp. 257 and 305; Engineers' and Architects' Journal, vol. 6, pp. 150, 187, and 219.]

A.D. 1842, November 8.—N° 9516.

ZANDER, Hinrik.—1. Improvements in engines, boilers, flues, and furnaces.

2. Paddle-floats. "First, instead of using a few large paddles, " I employ a number of smaller paddles presenting an equal or " greater extent of resisting surface; second, I place these smaller " paddles in such a relative position that a straight line shall pass " through the centres of each set of two, three, four, or more at an " angle of from thirty to fifty-six degrees."

The length of the line last mentioned should be nearly the same as that of the vertical from the water-line to the lowest point of the wheel. The operation of the improved construction is explained.

(Reference is made to a Patent in A.D. 1839, N° 8111; see *ante*, p. 147).

[Printed, 1*s.* 7*d.*]

A.D. 1842, December 8.—N° 9550.

GRANTHAM, John.—Various forms of engines for driving the propeller shaft of vessels, by direct connection with the piston-rods of reciprocating engines. The cylinders are above, below, on each side, placed vertically, horizontally, or inclined, and are fixed or oscillating.

By a Disclaimer, dated March 4, 1846, the patentee disclaims " the application of the power of the reciprocating engine to drive " the propeller shaft directly as above described;" also one of the modes described.

[Printed, 1*s.* 4*d.* Drawings. See London Journal (*Newton's*), vol. 23 (*conjoined series*), p. 1; Engineers' and Architects' Journal, vol. 6, p. 219.]

A.D. 1842, December 8.—N° 9551.

BROWN, James.—1. Two pistons moving up and down alternately, turn the same crank. One is underneath the crank, and turns it by a connecting rod to a T-cross-head on the head of the piston-rod. This cross-head is connected on each side to a beam below, the other end of which is connected to a cross-head on the other piston-rod.

2. The air-pumps and condensers of oscillating engines are arranged so as to bring their cylinders nearer to each other.

3. Disconnecting paddle-shaft. A disc *B* is fixed on the end of the shaft. Another disc *C* receives the end of the crank-pin, and turns on the shaft free from the disc *B*. The disc *C* carries catches, and there are slots in *B* and *C*, so that if one catch falls into a slot all the catches will fall into their slots. A moveable washer carries pins, which throw in or out all the catches as required. A brake ring acts on the shaft when it is to be stopped.

[Printed, 1*s.* 6*d.* Drawings.]

A.D. 1842, December 21.—N° 9563.

MOREAU, Gabriel Hippolyte.—A framework carrying floats turning on vertical spindles (not through their centres), is moved backwards and forwards behind a vessel, by rods passing through stuffing-boxes, and attached by a lazy-tongs apparatus to an engine within. Inclined projections cause the floats to present their broadest sides to the water during the effective stroke, and they swing round to pass edgeways through the water for the return stroke.

[The figures 9, 9, 9, in line 6, p. 5, seem to represent the parts marked *q*, *q*, *q*, in plate 2, figure 2.]

[Printed, 2*s.* 3*d.* Drawings.]

A.D. 1843, January 19.—N° 9592.

HAMER, James.—1. Air is forced out through tubes under water to propel a vessel.

2. Air is forced alternately into two channels below the water underneath a vessel; and while the air is forced into one, the other is allowed to fill with water.

3. A screw-propeller is connected by a shaft with Hook's universal joint to the axis of a wheel, with vanes on the periphery, by which it is turned by a steam jet, "as in Branca's engine."

[Printed, 10*d.* Drawings. See London Journal (*Newton's*), vol. 24 (*conjoined series*), p. 4.]

A.D. 1843, January 19.—N° 9593.

DUNDONALD, Earl of.—1. Improvements in packing rotary engines.

2. Boilers.

3. The arms or vanes of a screw propeller are placed in an inclined position to the axis of the shaft. The form represented shows the arms inclined, so as to form a conical figure by rotating, the base of the cone being turned outside the outside bearing.

4. The air from the paddle-boxes is conducted to the engine-room by oblique battens and angular plates.

[Printed, 1*s.* 3*d.* Drawings. See Repertory of Arts, vol. 2 (*enlarged series*), p. 193; Mechanics' Magazine, vol. 39, p. 269; Artizan, vol. 2, p. 167.]

A.D. 1843, January 19.—N° 9598.

SUNDERLAND, Thomas.—1. Screw propeller. Each blade is on a short arm, and is of a form bounded by two arcs of circles, the outer circle being concentric with the shaft, and the other having its convexity turned to the shaft.

2. Steam issues from a pipe against the air and propels a vessel.

3. The draught in a furnace is increased by a blower in the flue, and a damper regulates the supply of air.

[Printed, 6*d.* Drawings.]

A.D. 1843, April 20.—N° 9702.

BODMER, John George.—1. Locomotive engines.

2. Rolling mill and wheel tyres.

3. A steam-gauge and safety-valve.

4. A marine engine (p. 10). A high-pressure cylinder, a condensing cylinder, and an expansion cylinder, are placed together in an inclined position below and on each side of the shaft, which has two cranks very near each other, one for the high-pressure and the other for the condensing cylinders, so that the piston of each

high-pressure cylinder moves one way, while that of its corresponding condensing cylinder moves the other.

5. Disconnecting paddle-shafts. The engine-shaft and paddle-shaft are connected by spur wheels and internal wheels, in such a manner that the tightening of a break will force the engine-shaft gradually to turn the paddle-shaft.

6. A life-boat constructed of metallic plates.

7. A propeller composed of two vertical shafts, revolving near the stern, each of which carries under water vanes, which discharge the water by centrifugal force through an orifice in a case. The orifice may be turned in different directions to steer and back the vessel. The water enters in such a manner and in such quantity, as to be speedily discharged without much friction on the case.

8. A fan for blowing or exhausting air.

9. Stationary engines and pumps.

(Reference is made to a Patent in A.D. 1841, N° 8981; see *ante*, p. 163.)

[Printed, 3*s.* 9*d.* Drawings. See Mechanics' Magazine, vol. 39, p. 431.]

A.D. 1843, April 20.—N° 9704.

COBBOLD, Edward.—1. A life-buoy formed of tubes filled with air or light materials, to be worn on the human body.

2. A boat or sledge of tubes with sails to effect communication between a stranded vessel and the shore.

3. A raft of tubes to be propelled by screw-propellers or paddles.

[Printed, 1*s.* 8*d.* Drawings.]

A.D. 1843, May 25.—N° 9706.

JOHNSTON, James.—" Improvements in the construction of " steam-boilers and machinery for propelling vessels."

Form, construction, and arrangement of flues and water spaces in boilers.

By a Disclaimer, dated October 6, 1843, the patentee disclaims these words in the title, "and machinery for propelling vessels."

[Printed, 6*d.* Drawings. See Repertory of Arts, vol. 2 (*enlarged series*), p. 321.]

A.D. 1843, May 18.—Nº 9733.

WALKER, Robert.—To propel a vessel a screw revolves in a horizontal or inclined hollow cylinder under water, which by one or more passages communicates with the water fore and aft near the keel of the vessel.

[Printed, 6*d*. Drawings. See Mechanics' Magazine, vol. 39, p. 376.]

A.D. 1843, May 25.—Nº 9744.

GALLOWAY, Elijah.—1. The engine-shaft turns the screw-propeller shaft by the intervention of a mutiplying apparatus, consisting of a disc or plate with a groove on it (made according to the required results as explained). The disc is mounted on certain cranks, one of which is on the propeller-shaft, and the disc is moved by the action of rollers placed about the main-shaft, and working in the groove.

2. When bands or straps are used in multiplying gear, the wheels are to have fine pins on their peripheries, and the straps to have thick soft lining.

3. Screw-propeller. When one is used on each side of a vessel it may be unshipped by an apparatus consisting of chains from davits on the stern and through a hawse-hole at the quarter, which extricate the various bearings consecutively while the screw-shaft is withdrawn from within the vessel.

3. Paddle-wheels. Each wheel consists of two sets of arms and floats. One of these is fixed, and its floats are shorter than the wheel-shaft. The floats of the other set are so fixed by arms to a hollow shaft moveable along the paddle-shaft that they may be run in behind the other floats, and thus produce the effect of reefing the wheel.

[Printed, 10*d*. Drawings. See Repertory of Arts, vol. 3 (*enlarged series*) p. 87; London Journal (*Newton's*), vol. 24 (*conjoined series*), p. 9.]

A.D. 1843, June 8.—Nº 9759.

SMART, Robert.—Paddle-floats round at the edges, and presenting a convex curved surface to the water.

[Printed, 5*d*. Drawings. See Repertory of Arts, vol. 3 (*enlarged series*), p. 1.]

A.D. 1843, June 15.—N° 9783.

NEWTON, William Edward.—A hollow case in the hull of a vessel contains a drum-like paddle-wheel, the floats of which are caused to protrude beyond the periphery, and thus act on the water below the bottom of the vessel as the wheel revolves. Each float slides out and in upon the arms of the drum-wheel by the action of a cam or excentric guide on each side of the case, or by an excentric wheel on the paddle-shaft, and the floats may be all drawn inside the drum.

The case is so arranged as to allow the wheel to be lifted on deck.

[Printed, 9*d*. Drawings. See London Journal (*Newton's*), vol. 26 (*conjoined series*), p. 243.

A.D. 1843, July 6.—N° 9826.

BRUNET, James Joseph.—1. Reefing paddles. The floats are in pairs, one before and one behind the wheel arm, and they are united by a diagonal piece, which may be caused to grasp the arm, or be loose upon it by the action of a lever. The pair of floats may be moved out and in upon the arm by the action of a rod.

A wheel, with studs acting on all the levers, sets all the pairs of floats free, and another wheel acting on all the rods moves the floats out or in as required; after which they are again made fast in their new positions by turning the first wheel.

In another arrangement, one of the floats of each pair is fixed, and the other is connected to it by a rod, and moved by another rod worked by a wheel.

2. Water received at the bows is discharged by a three-throw pump through channels at the stern to propel a vessel.

3. Disconnecting paddle-shafts. One arm of the crank has on a projecting part a groove which receives the corresponding end of the crank-pin (fixed in the other crank-arm) cut flat at its sides. A ring, previously passed backwards over this crank-pin, is slid over towards the projecting piece, so as to bind the crank-pin and crank-arm together. The ring may be secured in this position by bolts.

[Printed, 2*s*. 3*d*. Drawings. See Mechanics' Magazine, vol. 40, p. 273; Engineers' and Architects' Journal, vol. 7, p. 36.]

A.D. 1843, July 10.—N° 9829.

SAMUDA, Jacob.—1. Arrangements of the cylinders, beams, and air-pumps of marine and other steam-engines.

2. Marine steam-engines for submarine propellers, with the cylinders working triangles carrying the connecting rods which reach down to the propeller shaft.

3. A propeller formed of a hollow drum revolving at the end of a horizontal shaft under water, and furnished with arms projecting inwards towards the centre of the drum.

4. Other improvements in steam-engines.

[Printed, 1*s*. 1*d*. Drawings. See Repertory of Arts, vol. 3 (*enlarged series*) p. 198; Mechanics' Magazine, vol. 41, p. 353; Engineers' and Architects' Journal, vol. 7, p. 37.]

A.D. 1843, July 13.—N° 9833.

MAUDSLAY, Joseph.—1. The multiplying machinery for driving a propeller shaft is composed of two drums, with many grooves on each, which are traversed by an endless rope led also over directing pullies. The rope may be tightened by a wheel on a moveable bearing.

2. A screw propeller on a shaft passing through the stern-post, with two rudders, each of them projecting downwards from the quarter without external bearings, and having their tillers so connected as to be used with a joint effect.

[Printed, 1*s*. 4*d*. Drawings. See Mechanics' Magazine, vol. 40, p. 129; Engineers' and Architects' Journal, vol. 7, p. 37.]

A.D. 1843, July 13.—N° 9835.

PINKUS, Henry.—A strong rail is laid down alongside a canal, and an engine in a boat draws the boat forward by moving "hands" cr cog-wheels along the rail.

(Reference is made to a Patent in A.D. 1840, N° 8644. See *ante*, p. 156.)

[Printed, 4*s*. 11*d*. Drawings. See Mechanics' Magazine, vol. 40, p. 319.]

A.D. 1843, August 3.—N° 9859.

BORRIE, Peter, and MAYER, Henry.—1. Rotary engines.

2. Oscillating engines, with both piston rods connected to the same crank, and the average angle between the piston rods about 80°.

3. Tubular boiler.

4. Disconnecting paddle-shaft. The crank-pin is held by an eye-piece on a circular plate, which turns freely on the paddle-shaft when the shafts are disconnected.

When the shafts are to be connected, a catch sets a cog-wheel in motion, so as to bring into action certain friction pieces between the parts connected to the detached parts of the shaft respectively.

5. A propeller. "Consists of three blades, *a, b, c,* of equal area " and the like pitch, keyed separately upon a shaft *d,* each of which " blades is a portion of a triple helix, that is to say, a portion of " three inclined planes wound spirally round a cylinder, and " increases gradually in breadth from the shaft towards the cir- " cumference." The blades revolve in different parallel planes. An arrangement of pullies is described for tightening the band of the multiplying gear.

Two such shafts and propellers may be applied to the same vessel, parallel to one another, and geared together by wheels, the blades of one working past those of the other.

[Printed, 2*s.* 10*d.* Drawings. See Mechanics' Magazine, vol. 40, pp. 257 and 305; Artizan, vol. 2, pp. 115 and 167; Engineers' and Architects' Journal, vol. 7, pp. 113 and 155.]

A.D. 1843, November 2.—N° 9918.

KIBBLE, John.—Two wheels at the side of a vessel move by their friction an endless chain or flexible band carrying floats that dip into the water.

[Printed, 1*s.* 4*d.* Drawings. See Repertory of Arts, vol. 4 (*enlarged series*), p. 79; Engineers' and Architects' Journal, vol. 7, p. 196.]

A.D. 1844, January 14.—N° 10,009.

FOULERTON, Robert.—To turn vessels with or without a rudder. A short shaft, with inclined vanes like a screw propeller, is placed under water across the vessel's length, which, by its action, will cause the vessel to turn on its centre. The aperture in which the shaft revolves may be closed at the sides by sliding valves.

[Printed, 7*d.* Drawings. See London Journal (*Newton's*), vol. 25 (*conjoined series*), p. 81.]

A.D. 1844, January 25.—N° 10,024.

DAVIES, Henry.—1. A vessel has two horizontal channels under water along its bottom; in each of these there are four sets of vanes on shafts like screw-propellers. The channels are partly contracted in the middle.

The current through each channel turns the two propellers near the stern, and their motion is communicated to the two propellers in advance.

2. The ends of boats towed in line are connected to each other by hollow box-like troughs, so as to form the vessels into a continuous surface.

[Printed, 10*d.* Drawings. See London Journal (*Newton's*), vol. 25 (*conjoined series*), p. 323; Engineers' and Architects' Journal, vol. 7, p. 367.]

A.D. 1844, February 2.—N° 10,034.

HODGSON, Robert.—Screw-propellers.

"First, the attaching, as before described, of the blades of fore-"and-aft propellers to their shafts at tangents coincident with "the plane of a right cone placed longitudinally with the apex "foremost; and, second, the employment of blades of the form of "parabolic sections, or of any other form possessing similar pro-"perties, whether attached to the shafts at tangents coincident "with a plane of a right cone placed longitudinally with the apex "foremost or in positions parallel to the same."

Several forms are depicted and a manner of geometrical construction explained.

[Printed, 9*d.* Drawings. See Mechanics' Magazine, vol. 41, p. 238, and vol. 56, p. 470; Engineers' and Architects' Journal, vol. 7, p. 319.]

A.D. 1844, February 8.—N° 10,045.

NEWTON, William Edward.—Various improvements in the apparatus for atmospheric railways.

Boats may be drawn on a canal by a piston moving in a tube at the side or at the bottom of the water, the air being exhausted from the tube by stationary engines.

[Printed, 4*s.* 2*d.* Drawings.]

A.D. 1844, February 13.—N° 10,051.

WOODCROFT, Bennet.—Varying pitch screw-propeller. Each of the blades may be turned round in the boss by an arm connected with the spindle of the blade.

At the end of each arm is a pin moving in a curved slot on a short hollow piece which moves along the shaft, on feathers, so that it turns with the shaft.

By pushing this hollow piece out or in along the shaft, by a forked lever at the end of a rod worked within the vessel the blades may be turned to different angles of pitch and retained there, while the particular angle they are set at may be indicated on a scale by the lever inside the vessel.

[Printed, 6½d. Drawings. See Repertory of Arts, vol. 4 (*enlarged series*), p. 277; London Journal (*Newton's*), vol. 27 (*conjoined series*), p. 346; Engineers' and Architects' Journal, vol. 7, p. 322.]

A.D. 1844, March 7.—N° 10,095.

FAIRBAIRN, William.—The driving-shaft of an engine has a wheel with internal teeth on it, which take into a toothed wheel on the shaft of a screw propeller.

[Printed, 5d. Drawings. See London Journal (*Newton's*), vol. 25 (*conjoined series*), p. 166; Engineers' and Architects' Journal, vol. 7, p. 370.]

A.D. 1844, April 10.—N° 10,141.

AITKEN, John.—1. Dredging.

2. Water machine for lifting heavy bodies.

3. Steam engines.

4. Vessels are drawn along a canal by attaching them to a piston working in a tube under water, the tube being fitted with valves like those of the atmospheric railway, and the water withdrawn by a fall at the end of the tube or by a pump.

5. A water-wheel on a barge used for discharging ships.

[Printed, 7d. Drawings. See Mechanics' Magazine, vol. 42, p. 172; London Journal (*Newton's*), vol. 26 (*conjoined series*), p. 319; Engineers' and Architects' Journal, vol. 7, p. 408.]

A.D. 1844, April 23.—N° 10,154.

LEAR, Peter.—A vertical shaft turning in the bottom of a vessel carries outside a horizontal circular frame furnished with flaps hinged to its arms. By rollers and cams the flaps are caused to act on the water during one part of their revolution, and then to fold up while they perform the rest.

[Printed, 7d. Drawings. See Repertory of Arts, vol. 5 (*enlarged series*) p. 13.]

A.D. 1844, May 17.—N° 10,189.

M'INTOSH, John.—1. A revolving engine worked by steam expanding an elastic tube between two wheels.

2. A boat is propelled by water ejected alternately from two tubes, which are elastic and furnished with a valve at each end opening in the same direction. The tubes are pressed by men who place one foot on each tube.

3. Steam is caused to press at intervals on a flexible partition in a vessel so as to expel water through tubes with proper valves, by which a boat carrying the vessel is propelled.

(This Patent is referred to in the Specification of a Patent in A.D. 1847, N° 11,537. See *post*, p. 201.)

[Printed, 1*s*. 3*d*. Drawings. See Repertory of Arts, vol. 5 (*enlarged series*), p. 87; Mechanics' Magazine, vol. 42, p. 110.]

A.D. 1844, May 17.—N° 10,190.

PILBROW, James.—Carriages on land and boats on a canal are drawn by a carriage on an improved form of atmospheric railway. A piston traverses a long tube exhausted of air, and it carries a rack piece on each side which turns spindles passing through stuffing-boxes, and carrying cog-wheels outside the tube.

A rack-piece attached to the carriage gears into these cog-wheels, and thus the carriage is drawn along, and others follow, or a boat is towed.

An atmospheric telegraph may be used in conjunction with the railway.

(This Patent is referred to in the Specification of a Patent in A.D. 1846, N° 11,069. See *post*, p. 195.)

[Printed, 1*s*. 7*d*. Drawings. See Mechanics' Magazine, vol. 41, p. 417; London Journal (*Newton's*), vol. 27 (*conjoined series*), p. 73; Engineers' and Architects' Journal, vol. 8, p. 28.]

A.D. 1844, June 4.—N° 10,212.

PHILLIPS, William Henry.—1. A fire annihilator.

2. A rotary engine turned by gas generated for it.

3. Gas generated in a cylinder is discharged through tubes underneath the water so as to propel a vessel.

[Printed, 2*s*. 9*d*. Drawings.]

A.D. 1844, July 3.—N° 10,239.

COFFIN, Guy Carleton.—Locomotive and marine engines worked by the action of a pendulum. It is not stated how the pendulum is to be moved.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1844, July 3.—N° 10,243.

BODMER, John George.—1. Various improvements in locomotive engines, furnaces, wheels, tenders, slide-valves, expansion gear, and atmospheric railways.

2. Marine engines for turning a screw propeller. The modifications described in his former Patents are referred to. The throttle-valve and expansion-valve are so connected that on starting the engine with very high pressure the throttle valve is nearly closed by opening the expansion-valve. The cylinders are parallel with the propeller-shaft, and they turn crown-wheels in opposite directions, both the wheels gearing with one on the propeller-shaft. The steam is worked at very high pressure, and the number of strokes of the pistons is equal to that of the revolutions of the propeller. The air-pump works slower. There is a loose safety top and bottom to each cylinder to prevent accidents from priming. The propeller is worked with a velocity alternately increasing and decreasing. A coupling-link unites the ends of the engine and propeller-shafts, which, in some cases, are made spherical. The stuffing-box of the shaft contains conical rings of brass, which may be tightened.

3. The wings or blades of the screw-propeller are fixed thus to the shaft:—One pair is attached to a boss, through which the shaft is placed, fitting it loosely. The end of the shaft screws into the solid boss of the second pair of blades. A tongue or catch on each boss causes them so to lock that in whichever way the shaft is turned the blades keep at proper distances from each other. A pin unites the screw and shaft to prevent unscrewing as the vessel backs astern.

4. Modifications of a centrifugal propeller described in a former Patent.

Water admitted at the centre of a wheel revolving on a horizontal shaft is expelled by the revolution of the vanes of the wheel through an aperture at the bottom of a vessel.

5. Disconnecting paddle-shaft, by moving a disc along one part of the shaft towards another on the other part, so as to bring certain segments to take hold, and cause the shafts to revolve together.

A somewhat similar arrangement is explained for coupling the ends of shafts.

6. A rudder to be used with a screw-propeller. The sternpost is a round iron bar, on which slides a tube with feathers fore and aft, constituting the rudder, It can be hoisted up along the bar.

(Reference is made to these former Patents in A.D. 1834, N° 6616 and N° 6617 (neither of which refer specially to Marine Propulsion); in A.D. 1841, N° 8981, see *ante*, p. 163; in A.D. 1843, N° 9702, see *ante*, p. 174; and in A.D. 1843, N° 9899, which does not refer to Marine Propulsion).

[Printed, 4*s*. 7*d*. Drawings.]

A.D. 1844, July 3.—N° 10,244.

HAYS, Christopher Dunkin.—Screw-propellers.

1. The relative speed of the propeller-shaft and the engine may be altered by gearing them through an additional shaft carrying on it a cog-wheel moveable on feathers; or conical drums may be used for the intermediate gearing

2. A bearing to resist the horizontal thrust of the propeller-shaft encloses the end of it (which turns on an adjusting screw) in a box half filled with water, in which is a stratum of oil.

3. The blades are fixed to the shaft by two rings, one of which may be screwed up and made fast so as to alter the angle at which the blade is placed.

(This Patent is referred to in the Specification of a Patent in A.D. 1845, N° 10,995. See p. 193, *post*.)

[Printed, 1*s*. Drawings. See Mechanics' Magazine, vol. 42, p. 193; London Journal (*Newton's*), vol. 26 (*conjoined series*), p. 171; Engineers' and Architects' Journal, vol. 8, p. 90.]

A.D. 1844, September 12.—N° 10,316.

HANDCOCK, Elias Robison.— Paddle-wheels. The floats are inclined at an angle to the radii of the wheel, and are fixed to arms which are tangents to a circle concentric with the wheel. Their surfaces may be curved. The present wheels may be altered to this form, which is called "the cycloidal wheel."

[Printed, 11*d*. Drawings.]

A.D. 1844, October 14.—N° 10,349.

HAMOND, Sir Graham Eden, Baronet.—Each paddle-float is secured to the arms of the wheel by a link placed on the arm before it is fixed in the rim. The other end of the link passes through a hole in the float, and the whole is made fast by a wedge driven through the link. Notches may be made in the arm to give a better hold to the link.

[Printed, 6*d*. Drawings. See Repertory of Arts, vol. 5 (*enlarged series*), p. 364; Mechanics' Magazine, vol. 42, p. 264; Engineers' and Architects' Journal, vol. 8, p. 160.]

A.D. 1844, December 7.—N° 10,425.

SLEIGH, William Willcocks.—By an arrangement of tubes and pistons the pressure of water is stated to be rendered productive of propelling power without any escape of the water.

[Printed, 9*d*. Drawings. See Mechanics' Magazine, vol. 42, p. 442.]

A.D. 1845, January 2.—N° 10,453.

TAYLOR, William Hannis. — Paddle-wheels. Each wheel turns horizontally or vertically in a case wholly submerged and open to the water at the part where the floats have their most effective action for propulsion. Water is admitted on both sides of the shaft by suitable channels so as to reach the wheel near the centre, and to be discharged at the circumference by its rotation.

[Printed, 1*s*. 3*d*. Drawings. See Mechanics' Magazine, vol. 43, p. 433.]

A.D. 1845, January 11.—N° 10,458.

SPENCER, George.—Locomotive engines are made to run on railways and thus to tow boats in a canal by guide wheels acting on a central rail or by cog-wheels gearing into a rack. The axles are so arranged as to allow the locomotive to turn sharp curves. The tow rope is fixed at the bow of the boat, and is led several times round a drum on the locomotive, and from thence to the stern of the boat, where it is made fast.

By turning the drum the direction of draught on the tow rope may be altered.

[Printed, 1*s*. 6*d*. Drawings. See Engineers' and Architects' Journal, vol. 8, p. 297.]

A.D. 1845, January 11.—N° 10,464.

CARTWRIGHT, Henry.—Feathering paddles. "First actuating "the paddles of paddle-wheels by means of cranks having bearings "in the framework of the wheel, which cranks in their turns are "caused to rotate by means of cog-wheels fixed on their axes, which "work into concentric stationary wheels of the same diameter and "number of teeth."

2. The floats are made of two curved sheets of iron rivetted at their edges, and securing the axis between them. The rim of the wheel is passed through an opening in the end of the float.

[Printed, 7*d*. Drawings.]

A.D. 1845, January 21.—N° 10,485.

MELVILLE, John.—1. Feathering paddles. Each float turns on a horizontal axis, and is feathered by rods attached to a ring round the paddle-shaft but excentric to it.

2. A similar mode of feathering the floats of a two-armed propeller.

3. The paddle-shaft may be raised or lowered in an arc of a circle, the centre of which is the engine-shaft, which is separate and parallel to the paddle-shaft. Or if the engines work a beam, the paddle-shaft may be altered in position and worked by an adjustable connecting rod.

[Printed, 6*d*. Drawings.]

A.D. 1845, February 5.—N° 10,511.

SEAWARD, John.—1. The connecting rod of a direct acting engine works from a small cross-head on the head of the piston rod, with arms curved back towards the cylinder, and entering recesses in the cylinder-head at each stroke.

2. The smoke from the furnace meets a fine shower of water, which partially depurates it, and it is drawn and forced through cylinders into the water.

3. The water is filtered before it reaches the boiler.

4. Water is forced out through a forked passage on each side of the rudder by three pumps, the piston rods of which are prolonged so as to form the piston rods of three steam cylinders, caused to work successively by being connected with three cranks at proper angles on a shaft. Each of the forked ways may be closed by a slide-valve.

5. The weight of slide-valves or other parts of engines is counterbalanced by hanging them to a beam, which is attached to a small piston in a cylinder connected with the condenser or filled with steam.

[Printed, 1*s*. 9*d*. Drawings. See Engineers' and Architects' Journal, vol. 8, *p*. 297.]

A.D. 1845, February 20.—N° 10,531.

HALL, Samuel.—1. Steam engines, boilers, furnaces, flues, and smoke-consuming apparatus.

2. Propelling a vessel by forcing air, gas, or water through apertures, under water.

3. Vibrating boards turn on vertical axes near the bow or stern, and are caused to move through a small angle by cranks to propel the vessel.

[Printed, 3*s.* 1*d.* Drawings. See Artizan, vol. 10, p. 2.]

A.D. 1845, March 3.—N° 10,544.

GORDON, Alexander.—The products of combustion from a furnace are directed through pipes to force up water or to propel a vessel or a carriage on land. Coal dust, nitre, or air may be forced into the fire to quicken it.

[Printed, 10*d.* Drawings. See Engineers' and Architects' Journal, vol. 8, p. 331; Mechanics' Magazine, vol. 43, p. 273, and vol. 46, p. 205.]

A.D. 1845, March 13.—N° 10,558.

BLYTH, John, BLYTH, Alfred, and HUBBUCK, George Parker.—1. Oscillating engines, beam engines, and boilers.

2. Paddle-floats. "Those parts of each such paddle which are "nearer to the centre of the wheel, and the other parts of the "same paddle which are further from the same centre, are (not- "withstanding the difference of speed wherewith they act in the "water) enabled nevertheless to act with efficacy in propelling the "vessel forward."

The floats are curved at the outside edge in a manner described at length (at pages 18, 19, 20, and 21), but there is no drawing of their form.

[Printed, 2*s.* 3*d.* Drawings. See Artizan, vol. 7, p. 49; Patent Journal vol. 1, p. 226.]

A.D. 1845, March 27.—N° 10,578.

TEISSIER, John Baptiste Simon, and TRIAT, Antoine Hyppolyte.—Several rods with hinged vanes (collapsing on the return stroke) are caused to vibrate fore and aft at a vessel's stern.

[Printed, 1*s.* Drawings.]

A.D. 1845, April 24.—N° 10,637.

MAUDSLAY, Joseph, and FIELD, Joshua.—1. A horizontal double cylinder engine. The two cylinders are end to end in a straight line, with an interval between in which the crank-shaft turns. There are two piston rods to each cylinder, so that two are above and two below the shaft, and all are joined to one cross-head and work only one crank.

2. A horizontal air pump.

[Printed, 9*d*. Drawings. See Mechanics' Magazine, vol. 43, p. 289.]

A.D. 1845, June 3.—N° 10,702.

HOOD, John Lionel.—1. Water in a cylinder under pressure communicates power by racks and wheels to move carriages on land and vessels on water.

2. Metallic springs are similarly used.

3. Steam, gas, or air is alternately expanded by heat and contracted by cold, so as to act like steam in a steam engine, for propelling purposes.

[Printed, 1*s*. 3*d*. Drawings.]

A.D. 1845, June 3.—N° 10,706.

LAWES, Thomas.—A piston moving along a tube exhausted of air between rails draws a rope passing round a wheel at the end of a tube and then fastened to a carriage or boat, which are thus to be drawn along.

[Printed, 9*d*. Drawings. See London Journal (*Newton's*), vol. 28 (*conjoined series*), p. 323.]

A.D. 1845, June 12.—N° 10,721.

ROSENBORG, Frederick.—1. Screw-propeller. The blades are curved and fixed to the arms in such a manner "that the edge "of the lower end of the blade is parallel to the main shaft, whereas "the top edge is at about an angle of thirty degrees to the main "shaft." The manner of constructing the curve is described with a diagram.

The blades are not connected to the shaft, except by the arms, which present their edges obliquely to the water so as to act themselves as propellers.

2. Water is forced out at the side of a vessel so as to steer it.

[Printed, 9*d*. Drawings. See London Journal (*Newton's*), vol. 28 (*conjoined series*), p. 332.]

A.D. 1845, June 23.—Nº 10,734.

GRIFFITHS, ROBERT, BOVILL, GEORGE HINTON, and HENNETT, GEORGE.—Atmospheric railways by which boats may be towed on canals.

The tubes are made of wood. The valves along them are improved. Compressed air may be forced behind the travelling piston by the same engine that exhausts the tube in front of it. An elastic packing is described, and a mode of acting on the valve in the piston.

[Printed, 2*s.* 4*d.* Drawings.]

A.D. 1845, July 12.—Nº 10,770.

MALCOMSON, JOSEPH.—1. Atmospheric railways by which vessels may be propelled on canals. A close pipe along the line communicates with sections of the valve tube between the rails by valves.

2. Pipes for compressed air machines are made like culverts and caulked.

[Printed, 3*d.* No drawings. See Repertory of Arts, vol. 7 (*enlarged series*), p. 112; London Journal (*Newton's*), vol. 28 (*conjoined series*), p. 14; Mechanics' Magazine, vol. 44, p. 110.]

A.D. 1845, July 29.—Nº 10,789.

BEADON, GEORGE.—1. The arms that carry the blades of screw propellers are curved in a volute form; other forms are delineated. A mode of connecting and disconnecting the parts of a screw propeller shaft by chains leading through tubes.

2. A spheroidal propeller. A curved surface is so wound round the shaft and secured at the ends that no arms are required.

3. The interior part of a propeller is filled up by a drum.

4. A boat is warped on a canal by two ropes alternately wound on drums aboard the boat.

5. The adhesion of a band to a wheel is increased by exhausting the hollow rim and thus causing the atmosphere to press the strap towards holes in the rim.

6. Land carriage.

7. A crutch rowlock has a circle suspended on horizontal axes and embracing the oar; thus the oar may move any way, as on "gimbals."

8. Water forced by steam to flow round and cool a propeller-shaft is admitted by a cam at each revolution of the shaft.

9. The same means applied to empty vessels.—Whale harpoons.

[Printed, 2*s*. Drawings. See Mechanics' Magazine, vol. 44, pp. 104 and 113, and vol. 45, pp. 205 and 406.]

A.D. 1845, July 29.—N° 10,790.

BROWN, Sir Samuel.—1. Sea-walls.

2. Land carriages.

3. Feathering paddles. The floats revolve under water on a horizontal or vertical shaft, and are feathered by the arm or spindle of each being turned by an inclined plane or an endless chain round a drum.

One of these propellers may work so near another that their circles of revolution may intersect. They must be geared together by wheels.

4. An endless chain of rollers, on which a vessel may be conveyed along a tramway.

[Printed, 1*s*. 1*d*. Drawings.]

A.D. 1845, July 30.—N° 10,793.

PALTRINERI, John.—"The application of the principle that "all the moving forces in general exist in better conditions to "produce available and useful motion and work when the said "moving forces are applied to the machines so as to render available at the same time their force of action and re-action, and to "produce two motions simultaneously."

Several applications of the principle are described, such as engines with two pistons in the same cylinder, a turbine with a second wheel moved by the water that leaves the first.

An electro-magnetic machine is partly described. "However, "I do not mean to show in figure 5 of the drawing 6 a machine "entirely made, but only to give a hint of the method by which "an electro-magnetic machine can be made to work by action and "re-action."

[Printed, 3*s*. 11*d*. Drawings.]

A.D. 1845, August 4.—N° 10,800.

FORRET, Charles Henry Joseph.—Screw propeller. Numerous and minute directions are given, with algebraic terms and tables, for constructing curved screw propellers.

[Printed, 9*d*. Drawings.]

A.D. 1845, August 22.—N° 10,819.

OXLEY, Thomas.—1. Screw propellers. The vanes are made to admit expanding pieces, which may be pushed out by levers worked by wheels turned by toothed wheels or bands. The propeller is on a hollow shaft, and the expanding apparatus is worked by an interior shaft.

2. The engine power is disconnected from the propeller shaft by a toothed wheel, which causes a moveable part of the shaft to put a clutch out of gear.

3. Paddle-wheels. Each float is moveable along the arms of the wheel and it floats inwards or falls outwards as the waves rise or the wheel is immersed by the rolling of the vessel. Toothed racks and levers are used for self-adjusting floats, and springs are applied to check the shocks.

4. Each float or vane of a submarine propeller turns in its radial axis, and is feathered by curved guide pieces which work an elbow on the vane.

The propeller is prepared for backing astern by a shaft with cog-wheels which alter the position of the curved guides.

5. The machinery of a propeller under water may be shut in by waterproof doors, and air is then forced into the enclosure to expel the water and allow men to have access to the interior. By this means the propeller may be shipped and unshipped.

[Printed, 2*s*. 9*d*. Drawings. See Mechanics' Magazine, vol. 44, pp. 161, 177, and 497.]

A.D. 1845, September 18.—N° 10,836.

PERKINS, Stephen Higginson.—1. The pistons of an engine are connected to cranks at right angles to each other. The steam is admitted into one cylinder and thence into the other to work expansively. A centrifugal blower draws the hot air from a flue and forces it through tubes about which the water passes on its way to the boiler.

2. Water or oil is forced by the engine into a case wherein is a "hydrostatic rotator," (an excentric drum with pistons, protruded as it revolves in the case,) and thus turns a propeller shaft faster than the engine shaft.

3. The shaft of the propeller at the stern is borne on an arm supported above on bearings so that when the arm is turned round a half circle the propeller is raised out of the water.

[Printed, 2s. 1d. Drawings. See Mechanics' Magazine, vol. 44, pp. 257 and 273.]

A.D. 1845, October 2.—N° 10,841.

HILL, JOHN REED.—Atmospheric railways, which may be placed along a canal and thus tow boats. The carriages move inside a tube, behind a piston fitting the tube, and the air is exhausted in advance of the piston. The carriage may be propelled through the tube by air forced behind it, "the apparatus for that purpose "being attached to the piston carriage, or the next following "carriage, so as to be independent of stationary power." The carriages are also described as moving partly outside the tube, and connected with the piston carriage. In this case there are valves or flaps like doors hinged at the sides to keep the exhausted part of the tube air-tight, in a manner not explained.

[Printed, 6d. Drawings. See Repertory of Arts, vol. 7 (*enlarged series*), p. 342; London Journal (*Newton's*), vol. 28 (*conjoined series*), p. 326; Engineers' and Architects' Journal, vol. 9, p. 218.]

A.D. 1845, October 9.—N°. 10,857.

LAKE, JOHN.—Atmospheric railway. The tube is filled with steam, which is condensed, and thus produces a partial vacuum, which is then traversed by a piston connected with the carriages by a bar through a longitudinal valve. Steam forced behind the piston also propels it.

The tube may be caused to expand by steam, and thus "through the medium of levers" to force the carriage along without a longitudinal valve or piston.

[Printed, 9d. Drawings. See Engineers' and Architects' Journal, vol. 9, p. 152.]

A.D. 1845, November 17.—N° 10,944.

PARKHURST, Stephen R.—At the side of a vessel paddle-wheels on vertical axes revolve in cases, which allow the floats to act on the water outside.

[Printed, 6*d.* Drawings. See London Journal (*Newton's*), vol. 28 (*conjoined series*), p. 401; Patent Journal, vol. 1, p. 94; Engineers' and Architects' Journal, vol. 9, p. 186.]

A.D. 1845, November 20.—N° 10,961.

PARLOUR, Samuel.—Paddlefloats. Each float is formed "by "taking a hollow cone of sufficient thickness, and cutting it through "the vertex at right angles to the plane of the base." The equal parts are placed with their broad ends together.

[Printed, 5*d.* Drawings. See Repertory of Arts, vol. 8 (*enlarged series*), p. 19; London Journal (*Newton's*), vol. 28 (*conjoined series*), p. 343; Patent Journal, vol. 1, p. 23; Engineers' and Architects' Journal, vol. 9, p. 221.]

A.D. 1845, November 20.—N° 10,964.

THOMPSON, William Corcaden.—At each side of a vessel a drum revolves in a water-tight case, which allows floats on the drum to act on the water.

[Printed, 9*d.* Drawings. See London Journal (*Newton's*), vol. 29 (*conjoined series*), p. 337.]

A.D. 1845, December 10.—N° 10,995.

HAYS, Christopher Dunkin.—Screw-propellers. Each blade is fixed to the boss by a small round end, and within the boss (which is hollow) this end carries an elbow, which may be turned by a bar leading through the shaft (hollowed for the purpose) and worked by wheels. The propeller is lifted out of its bearings, which may be detached when it is to be unshipped. (Reference is made to a Patent, in A.D. 1844, N° 10,244. See *ante*, p. 184.)

[Printed, 9*d.* Drawings. See London Journal (*Newton's*), vol. 29 (*conjoined series*), p. 73; Patent Journal, vol. 1, p. 74.]

A.D. 1845, December 23.—N° 11,017.

PENN, John, HARTREE, William, and MATHEW, John.

1. The piston-rod is hollow, and is continued through both ends of the cylinder. The connecting rod is attached inside to the middle of the piston-rod.

2. The valves of horizontal double-acting air-pumps are arranged so as to be readily accessible.

3. The horizontal thrust of a propeller-shaft is secured on a steel rim, which is slowly moved by an excentric cog-wheel, so as to present different parts to the action of the bearing part of the end of the shaft.

(Reference is made to a Patent, in A.D. 1828, N° 5719; see *ante*, p. 108; also to a Patent, in A.D. 1835, N° 6801; see *ante*, p. 119.)

[Printed, 2*s.* 7*d.* Drawings. See Patent Journal, vol. 1, p. 113; Engineers' and Architects' Journal, vol. 9, p. 247.]

A.D. 1846, January 12.—N° 11,034.

SEAWARD, John.—1. Steam-engines.

2. In the boiler of a marine engine the steam passes through a partition with holes in it, and reaches the steam-pipe by a circuitous course to reduce the risk of "priming."

3. Screw-propellers. The propeller is borne on a forked piece attached to a lever passing upwards, and by which it may be lifted from the propeller-shaft, the end of which has a screw upon it taking into one in the boss of the propeller; or there are two vertical rods from above the propeller, which may be lowered so as to let each of their ends screw into holes in the blades of the propeller.

4. The end of the propeller-shaft and the corresponding part of the bearing to receive the horizontal thrust are partly hollowed, and oil or water is forced between them so as to form a cushion and diminish the friction.

[Printed, 2*s.* 11*d.* Drawings. See Engineers' and Architects' Journal, vol. 9, p. 284; Patent Journal, vol. 1, pp. 179 and 199.]

A.D. 1845, January 13.—N° 11,039.

MAUDSLAY, Joseph.—Screw-propeller.

1. The propeller is shipped by drawing it vertically up along a grooved guide, on which a strong piece supporting the shaft bearings slides. The line of the shaft is to one side of the keel. The guide supporting the bearings is secured to the stem by two horizontal fore and aft pieces, the lower being hollow, so as to admit

the shaft to work inside it. The parts of the shaft are disconnected before the propeller is raised.

2. Disconnecting shaft. The end of one piece of the shaft is conical and fits into the end of the other piece. The pieces are caused to work together by screwing them into close contact.

[Printed, 9*d*. Drawings. See Engineers' and Architects' Journal, vol. 9, p. 252; Patent Journal, vol. 1, p. 178.]

A.D. 1846, January 20.—N° 11,044.

TAYLOR, PETER.—1. The shafts of screw-propellers are mounted side by side, so that they may converge or be parallel, and be horizontal or inclined as required. The blades of each successive set may be of different sizes, and they are represented as working so as to overlap each other in revolving, but without the blades of one shaft meeting those of another.

2. The boiler and cylinders may be moved on rails so as to alter the trim of a steam-vessel.

3. An ice-plough for steam-boats.

4. Rotary steam-engines.

5. Boats are connected in a train by strong joints, which cause each boat partly to support that preceding it.

6. A vessel nearly covered in has screw-propellers amidships.

[Printed, 4*s*. 6*d*. Drawings.]

A.D. 1846, January 22.—N° 11,058.

CAMPIN, FREDERICK WILLIAM.—1. Land carriages.

2. A vessel is propelled by springs and conical screws acting with "pneumatic helicondal fly-wheels or air turbines" in a manner not explained.

[Printed, 5*d*. Drawings. See Repertory of Arts, vol. 8 (*enlarged series*) p. 285; London Journal (*Newton's*), vol. 29 (*conjoined series*), p. 163.]

A.D. 1846, January 31.—N° 11,069.

PILBROW, JAMES.—Atmospheric railway, applied also to tow vessels on canals. The rack-piece is not solid, but composed of linked segments, and a curved valve is introduced at points on the tube.

(Reference is made to a Patent, in A.D. 1844, No. 10,190; see *ante*, p. 182.)

[Printed, 10*d*. Drawings. See Mechanics' Magazine, vol. 45, p. 169, and vol. 48, p. 213; Patent Journal, vol. 1, pp. 68 and 194, and vol. 4, p. 356.]

A.D. 1846, February 25.—Nº 11,101.

THOMPSON, GEORGE ALEXANDER, and WRIGHT, JOSEPH.—Two grooved horizontal wheels revolve near each other in a case, and by pistons or projections from either wheel working in curved recesses in the other, a current of water is caused to discharge itself under water at the stern of the vessel.

[Printed, 1*s.* 3*d.* Drawings. See Repertory of Arts, vol. 8 (*enlarged series*), p. 270; London Journal (*Newton's*), vol. 29 (*conjoined series*), p. 289; Patent Journal, vol. 1, p. 244.]

A.D. 1846, February 27.—Nº 11,114.

TEMPLETON, JOHN SAMUEL.—1. Railway locomotion.

2. Screw-propeller. The propeller is a blade of iron "turned or "curved into the form of a conoidal volute or helix, and bolted "securely to the propeller shaft along its inner axial or longitudinal "edge excentrically, and also at or near its apex, in which is an "aperture to permit the propeller shaft to pass through it." (See p. 25 of the Specification.)

Two or more such propellers may be combined on the same shaft.

[Printed, 7*s.* 8*d.* Drawings.]

A.D. 1846, March 11.—Nº 11,129.

BOVILL, GEORGE HINTON, and GRIFFITHS, ROBERT.—

1. Atmospheric railways.

2. A train or a carriage towing a boat is propelled by pulleys or traction-rollers, worked by stationary engines, and which by their friction move a draw-bar attached to the carriage.

3. Raising or lowering minerals.

4. Transmitting gas.

[Printed, 2*s.* 1*d.* Drawings. See Patent Journal, vol. 1, p. 273.]

A.D. 1846, March 25.—Nº 11,151.

TAYLER, JOSEPH NEEDHAM.—1. At each side of a vessel is a wheel revolving on a vertical axis under water, and carrying floats, each set on a vertical axis through its centre. The floats are feathered for the return stroke by the action of hooked levers acting on pins, or by an excentric or grooved guide-plate, in which a pin on the float travels.

2. Ballast dredging apparatus,
3. Locomotive on land.

[Printed, 1s. 8d. Drawings.]

A.D. 1846, May 5.—N° 11,195.

CARTER, John.—Feathering paddles. Each float turns on a horizontal axis, and is feathered by a long rod attached at one end to the float, and at the other to a roller, which is moved out and in towards the centre of the wheel, between guides, by an excentric or "irregular railway" or double guide fixed to the vessel's side, and embracing the roller, so as to cause it to move according to the curve of the guide. Levers and pendulums secure the proper action of the rod, when it is at the dead point of its motion.

[Printed, 8d. Drawings. See Repertory of Arts, vol. 9 (*enlarged series*), p. 1; Patent Journal, vol. 1, p. 401.]

A.D. 1846, May 7.—N° 11,199.

MELLING, Thomas.—1. "The combination in one steam-" engine of a high-pressure cylinder, with two open-ended atmo-" spheric cylinders; the former placed between the latter, and the " pistons of all the three cylinders being attached to one common " piston-rod," and other arrangements connected with it.

2. An hydraulic blowing-machine withdraws the steam and air from the cylinder and condenses it.

3. Boilers. Parallel links, wheels, tyres, blast-pipes, cork plugs, slide valves, a "friction-hammer," plummer blocks.

4. To prevent priming in marine boilers, a sheet of wire gauze or metal, or netting of vulcanized gutta percha, is suspended on the surface of the water by rings on guide-rods. (See p. 17 of the Specification.)

[Printed, 5s. 9d. Drawings. See Mechanics' Magazine, vol. 45, pp. 505 and 578, vol. 46, p. 1, and vol. 48, p. 97; Practical Mechanics' Journal, vol. 2, p. 222 Patent Journal, vol. 1, p. 423.]

A.D. 1846, May 13.—N° 11,207.

JEFFREYS, Julius.—1. At each side of the bow and stern of a vessel is fixed a frame carrying vanes, each turning on a horizontal axis, and regulated by stops. The rolling and pitching motion of the vessel causes these frames to move in the water, so as to act upon it to propel the vessel, and to let their several vanes feather when moving in the other direction.

2. Boilers and furnaces.

[Printed, 1*s.* 7*d.* Drawings.]

A.D. 1846, May 26.—N° 11,221.

MONTGOMERY, JAMES.—1. Boilers.

2. Screw-propeller. The cylinders are vertical and inverted, the crossheads being below. The crank shaft has cranks at right angles to each other, and the parts of the shaft worked by the respective cylinders are connected by a coupling link, so that the cylinders may be placed very near each other. A shaft is coupled to the crank shaft and the propeller shaft, and the form of its cross section allows it to yield slightly to a twisting strain. The propeller works in gudgeons moveable along vertical slides by ropes or chains from above. A slide valve closes the opening through the forward stern-post.

In another form propellers of different sizes are attached to strong arms turning on bearings above in the stern, so that either of the propellers may be lowered and put in action.

3. Plates for boilers and vessels.

4. Grates and boilers.

[Printed, 1*s.* 11*d.* Drawings. See Patent Journal, vol. 2, p. 495.]

A.D. 1846, June 29.—N° 11,273.

ANDERSON, SIR JAMES CALEB.—1. Cylinders are so arranged round a wheel with an excentric cam that when the wheel turns round water flows through tubes towards those cylinders that are on the descending side. This "power-wheel" may be used in propelling a vessel.

2. In another form the water flows towards a vacuum in each cylinder as it begins to descend.

3. Locomotion on land.

4. Boiler.

5. Steam-plough.

6. Vegetable fibre made explosive like gun-cotton is exploded alternately by electricity in two pistons connected by crossheads, so as to move machinery.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1846, July 23.—N° 11,303.

CLAUSSEN, Peter.—1. Two vertical frames are moved alternately fore and aft under water at a vessel's stern by piston rods through stuffing-boxes. Each frame carries floats turning edgeways for the return stroke.

2. Drums revolve on a horizontal axis in a compartment under a vessel, and carry floats, which are caused to project only during the time for an effective stroke on the water, and to lie flat at other times by an arm on each float, which works in a fixed excentric guide.

3. Construction of vessels.

4. Propelling a vessel by turning one or more sheave-wheels on which a rope is wound and fixed at the ends to the earth.

[Printed, 2*s*. 7*d*. Drawings. See Patent Journal, vol. 2, p. 638; Engineers' and Architects' Journal, vol. 10, p. 88.]

A.D. 1846, August 15.—N° 11,335.

BUCHANAN, John.—1. Construction of vessels.

2. Screw-propeller. The shaft is supported on elastic springs. The blade is attached to the shaft so as to be capable of turning on its own axis to a certain angle limited by shoulders, and thus to yield to the water when it exercises adverse pressure, or when the engine is stopped to allow the blade to feather itself fore and aft. The thrust of the shaft is received at a point immersed in the external water.

[By Disclaimers, dated February 15, 1847, and February 7, 1851, the patentee disclaims that part of his invention relating to the construction of ships.]

[Printed, 1*s*. 3*d*. Drawings. See Repertory of Arts, vol. 9 (*enlarged series*), p. 261; Patent Journal, vol. 2, p. 704; Engineers' and Architects' Journal, vol. 10, p. 178.]

A.D. 1846, August 17.—N° 11,340.

REMINGTON, George.—Oscillating cylinders, with two pistons turning cranks, which may be connected in marine engines. The cylinders oscillate on gudgeons in the middle, and the pistons approach and recede from each other at each stroke.

[Printed, 3s. 3d. Drawings.]

A.D. 1846, August 26.—N° 11,352.

BESSEMER, Henry.—1. Locomotive engines.

2. The multiplying gear by which a shaft is to be turned faster than that worked by the engine-crank consists of cog-wheels, one of which is in three pieces, so attached by springs that the teeth of the two side parts may be allowed to yield a little under pressure, and thus avoid the " back lash " of wheels with rigid teeth.

3. The waste steam turns a hollow shaft by discharging itself through two axes on the shaft with large tangential openings turned opposite ways. These axes may revolve inside the condenser.

[Printed, 1s. 5d. Drawings. See Mechanics' Magazine, vol. 46, p. 507; Patent Journal, vol. 2, p. 755.]

A.D. 1846, September 25.—N° 11,386.

SIMPSON, Thomas Bartlett.—" The employment of wheels " with open radial leaves or floats rotating horizontally, vertically, " or obliquely, and wholly or partially below the water-line," in combination with wheel-cases formed so as to cause the water to be discharged in a direction nearly parallel to that of the vessel's course.

In one form each case has central openings at the top and bottom. To ensure a proper discharge of the water as the vessel is to move ahead or astern, there is a curved moveable side in one part of the case, which may be so turned on a pin as to alter the form of the interior of the case. The case itself may be pushed outwards by strong screws, or withdrawn wholly within the recess.

If the floats are wider at the top than the bottom, the water may be led into the wheel by the bottom only (p. 6, Specification).

In another form the case is fitted into a recess in the vessel, and the water enters at one side by a spirally inclined passage until it *comes in* contact with the floats, which are inclined to their axis.

In another plan, the case is water-tight on all sides, except in front and at bottom, and the water enters by a passage from the forward part of the vessel.

[Printed, 2*s*. Drawings. See Mechanics' Magazine, vol. 47, pp. 443 and 527; Artizan, vol. 5, p. 266; Patent Journal, vol. 2, p. 735.]

A.D. 1846, October 15.—N° 11.418.

SOUTHWORTH, Ebenezer.—1. Rotary steam-engines.

2. Screw-propeller. The shaft carries two blades, each of them semicircular in form, concentric with the shaft, and with their planes inclined at about 30° to the axis of the shaft.

3. Raising water.

[Printed, 10*d*. Drawings.]

A.D. 1847, January 19.—N° 11,537.

M'INTOSH, John.—1. Rotary engines.

2. Locomotives on land.

3. At each side of a vessel flexible tubes under water are alternately filled with steam, and allowed to collapse. The vessel is propelled by the action on the water of the protuberant part of each tube.

(Reference is made to a Patent in A.D. 1844, N° 10,189; see *ante*, p. 181.)

[Printed, 1*s*. 3*d*. Drawings. See Repertory of Arts, 10 (*enlarged series*), p. 148; Patent Journal, vol. 3, p. 211.]

A.D. 1847, January 21.—N° 11,538.

BEADON, George, and SMITH, Andrew.—1. A vessel is propelled along a canal by hauling on a warping line which passes round a "whelp wheel" on board the vessel, and so formed with slotted spokes that the part embraced by the warp may be enlarged or reduced in radius according to the power, load, and speed required.

2. The warp is held by two rollers pressed on it at each side of the part where it touches the wheel.

3. Locomotive on land.

4. Other modes of securing a proper bite or hold between the warp and the wheel by the action of pistons, which press the rope against one side flange of the wheel and relax their hold when the

warp line has to part from the wheel. The pistons are moved by steam or air, or by rods worked by cams on the wheel strap; or the rope is caused to bear upon the wheel under considerable tension by passing it through rollers before it comes to and after it leaves the wheel; which last rollers are made to move faster than the former.

5. Tug-boats are to draw trains of barges from the lower to a higher level of a canal without locks. The tug-boat first pulls itself up a railway on an incline from the lower to the higher level, and then draws up each barge separately.

[Printed, 2*s.* 8*d.* Drawings. See London Journal (*Newton's*), vol. 31 (*conjoined series*), p. 157; Patent Journal, vol. 3, p. 238; Engineers' and Architects' Journal, vol. 10, p. 291.]

A.D. 1847, May 4.—N° 11,684.

GREENHOW, Conrad Haverkam.—1. Construction of vessels.

2. A centrifugal submerged propeller on a horizontal axis (across the vessel), and with blades curved at their edges.

[Printed, 1*s.* Drawings. See Repertory of Arts, vol. 10 (*enlarged series*), p. 321.]

A.D. 1847, May 4.—N° 11,685.

HENWOOD, William.—1. The rudder is in the stern dead wood of the vessel wholly under water, and the post to which it is attached is forward of the usual rudder post. A screw propeller may work astern of the rudder and above it.

2. Construction of vessels.

[Printed, 11*d.* Drawings. See Repertory of Arts, vol. 11 (*enlarged series*), p. 7; Patent Journal, vol. 3, p. 570; Engineers' and Architects' Journal, vol. 11, p. 47.]

A.D. 1847, May 6.—N° 11,695.

SEYRIG, Johann Gottlob—1. The use of a turbine or centrifugal wheel and a screw-propeller in such conjunction that the currents produced shall simultaneously help both machines. Several modifications are described.

2. Propelling air and water from the top and bottom of a cylinder *through* a tube under water to propel a vessel.

3. Conversion of rectilinear reciprocating motion into circular motion by the action of pins moving along endless spiral grooves in shafts.

[Printed, 1*s.* 8*d.* Drawings.]

A.D. 1847, June 12.—N° 11,746.

STEVENS, FRANCIS BOWES.—1. Air is forced through tubes to the outside of the lower part of a vessel's hull and runs along projections on the planks to diminish the friction between the hull and the water.

2. Holes are opened to the water below the stern and to the air above to diminish the resistance to the vessel from "the suction" of the water in the wake.

(Reference is made to a Patent in A.D. 1818, N° 4253; see *ante*, p. 107.)

[Printed, 10*d.* Drawings. See Repertory of Arts, vol. 11 (*enlarged series*), p. 26; Mechanics' Magazine, vol. 47, p. 604; Patent Journal, vol. 4, p. 77.]

A.D. 1847, June 22.—N° 11,763.

MACINTOSH, JOHN.—1. Steam-engines.

2. Screw-propeller. Each blade is composed of an elastic piece or is mounted on an arm with a spring.

The blades may be fixed for turning ahead or astern by rods, which go through an enlarged part of the shaft into the vessel, so that they may be set by an apparatus within.

[Printed, 2*s.* 5*d.* Drawings. See Repertory of Arts, vol. 11 (*enlarged series*), p. 298; Artizan, vol. 9, p. 30; Patent Journal, vol. 4, p. 130.]

A.D. 1847, June 22.—N° 11,764.

SOUTTER, JAMES, and HAMMOND, WILLIAM FREDERICK.

1. Two semi-rotary engines are combined. The pistons are leaves attached to shafts, and are caused to turn back and forward. The combined engines form a "cylinder which nearly resembles in its "external form two spherical frustums united together at their "narrow ends."

The shafts are in a continuous line, but work independently, and each has an arm at its outer end which turns the crank by a connecting rod.

2. Two distinct cylinders may be arranged so that each of their arms works one crank turning one paddle-wheel.

3. A lubricator.

[Printed, 1*s.* 10*d.* Drawings. See Mechanics' Magazine, vol. 48, p. 1; Patent Journal, vol. 4, p. 124.]

A.D. 1847, July 23.—N° 11,813.

RAYNER, Henry Samuel.—1. Water pumped through a tube from the bows is discharged by another opening towards the stern.

2. A piston with a valve opening outwards is moved horizontally in a cylinder so as to act directly on the water. The partial vacuum caused behind the piston may be used for an air-pump.

[Printed, 1*s.* 1*d.* Drawings.]

A.D. 1847, July 29.—N° 11,820.

JONES, Stopford Thomas.—1. Steam-engines.

2. Paddle-wheels. Each wheel is constructed with several sets of floats so arranged that one in each set is in advance of the next in the set adjoining on one side, and overlaps the floats on both sides of it.

3. The centre of a paddle-wheel is a hollow water-tight cylinder or hollow polygon "with a tube in the centre to slide on the "main shaft."

4. Paddlefloats of corrugated iron.

[Printed, 10*d.* Drawings. See Repertory of Arts, vol. 11 (*enlarged series*), p. 150; Mechanics' Magazine, vol. 48, p. 217; Patent Journal, vol. 4, p. 273.]

A.D. 1847, September 6.—N° 11,854.

VINT, Henry.—Paddle-wheels. These are partially enclosed in cases, open at the bottom only, where the floats operate on the water; the cases may be let into recesses in the sides of the vessel, and curved guards or shields may surround the cases.

[Printed, 6*d.* Drawings. See London Journal (*Newton's*), vol. 33 (*conjoined series*), p. 191; Mechanics' Magazine, vol. 55, p. 290; Artizan, vol. 9, p. 239.]

A.D. 1847, October 7.—No. 11,887.

BROWN, Sir Samuel.—1. Screw-propellers. The keel at the lower part of the opening for the propeller in the dead wood is made of iron, to allow the blades to be as long as possible.

2. The keel may be entirely cut away in this part to allow the blades to protrude below its level as they revolve. The end of the shaft turns in the rudder post and holds it firmly by a boss on the shaft grasped by a grooved bearing.

3. The propeller blades may be set to a required angle by bringing into gear a cogged wheel in the boss, which turns a wheel on the axis of each blade.

The blades may be reefed or shortened by bringing into gear another cog-wheel on a shaft working through the (hollow) propeller shaft, and turning a wheel for each blade. This wheel moves a shifting part of the blade by a screw rod along the centre of the blade.

4. The blades may be removed separately by drawing them upwards along grooved guides taking into their edges. The opening in the dead wood may be closed by shutters at each side.

5. A sliding keel to increase the effect on the rudder.

6. Paddle-wheels.—Each float may be removed, and a cross-bar is then fixed to the rims at each side by screws.

7. Each float may be reefed by turning nut-headed screw rods along the axis of the wheel supporting the float.

8. The arms of the wheel are connected by light lattice-work, so that when one part is shot away the rest will hold secure.

9. A mariner's compass.

(The letters at lines 22 and 23, page 5, of the Specification seem to refer to Figure 14 of the Drawings.)

[Printed, 3*s.* 3*d.* Drawings.]

A.D. 1847, October 7.—Nº 11,889.

BARBER, THOMAS HUNT.—Paddle-wheels. The two sides of the wheel are not connected by the shaft, but the outer side revolves on a shaft, which turns downward, and is cranked so as to carry inside the wheel a drum excentric to the wheel.

Each float is protruded and withdwarn through the (cylindrical) periphery of the wheel, by a rod attached to the float and to the drum within. The paddle-wheel may be wholly submerged. The effect may be produced by an excentric instead of the cranked axis, or the interior drum may be governed by excentrics hung on fixed centres and turned round by cog-wheels.

[Printed, 9*d.* Drawings. See Repertory of Arts, vol. 11 (*enlarged series*), p. 267; Patent Journal, vol. 4, p. 526; Engineers' and Architects' Journal, vol. 11. *p.* 168.]

A.D. 1847, October 14.—N° 11,900.

AYRE, WILLIAM.—A horizontal bar carrying vertical floats is mounted fore and aft on two cranks, so as to move the floats through the water and lift them out for the return stroke.

Several such bars are used together.

[Printed, 5*d*. Drawings. See London Journal (*Newton's*), vol. 32 (*conjoined series*), p. 259; Patent Journal, vol. 4, p. 528.]

A.D. 1847. November 2.—N° 11,932.

VON RATHEN, ANTHONY BERNHARD.—1. Machinery for compressing and condensing air.

2. Towing vessels along a canal by compressed air contained in portable reservoirs (as described in former Patents referred to). The air is heated to restore the caloric lost by its expansion, and the machinery to work by the compressed air is improved.

(Reference is made to a Patent, in A.D. 1841, N° 9038, see *ante*, p. 165; also to a Patent, in A.D. 1847, N° 11,800. This latter Patent does not relate to Marine Propulsion).

[Printed, 1*s*. 10*d*. Drawings. See Artizan, vol. 6, p. 152.]

A.D. 1847, November 2.—N° 11,936.

COULLON, JEAN CHARLES VICTOR.—An oar is moved by machinery at a vessel's stern, so as to operate on the water by a sculling motion. The axis of the oar is at an angle of about 45° to the water, and it is supported by a ball and socket, which allows the blade to describe a figure 8 in the water. The part above this bearing is forked into two limbs, one of them rigid, the other opening on a hinge-like joint.

The end of each limb turns loosely in a socket near the circumference of one of two cog-wheels, gearing into each other, and slightly inclined, but in opposite directions. These wheels are turned by the engine-shaft, and by their operation on the limbs give the necessary motion and direction to the blade of the oar.

[Printed, 8*d*. Drawings.]

A.D. 1847, November 6.—N° 11,946.

PEDDER, JAMES.—1. Steam-engines.

2. Water is forced out through an aperture under water near a vessel's stern. Directions are given to regulate the size of the

aperture in different cases. The water is used to condense steam before it is discharged.

A "self-exhausting condenser" is described (p. 11 of the Specification), which, by the action of a valve worked by a cam, is to dispense with the air-pump.

[Printed, 3*s*. 8*d*. Drawings. See Patent Journal, vol. 4, p. 617, and vol. 5, p. 71.]

MARINE PROPULSION.

(EXCLUDING SAILS.)

(PART III.)

A.D. 1840, January 7.—N° 8337.

(The abridgment of this Specification was omitted from Part II.)

POOLE, MOSES.—A vessel is propelled by a screw propeller acting on the air.

[Printed, 7*d*. Drawings.]

A.D. 1848, January 11.—N° 12,020.

STOW, GARDNER.—1. At each side of a vessel a screw propeller is supported so that the inclined vanes dip into the water.

2. The vanes are of sheet iron and wood.

[Printed, 9*d*. Drawings. See Artizan, vol. 6, p. 227; Patent Journal, vol. 5, p. 201; Engineers' and Architects' Journal, vol. 11, p. 286.]

A.D. 1848, February 8.—N° 12,050.

FOWLES, ROBERT.—"Fan propellers." These are vanes like a fish's tail—attached by hinged joints at a vessel's stern, and caused to vibrate up and down or horizontally by machinery.

[Printed, 9*d*. Drawings. See London Journal (*Newton's*), vol. 33 (*conjoined series*), p. 170; Artizan, vol. 6, p. 273; Patent Journal, vol. 5, p. 975.]

A.D. 1848, February 10.—N° 12,064.

DUNDONALD, EARL OF.—1. Boilers and furnaces.

2. Steam from a "generator" led along a pipe to a "reservoir" works a stern propeller by engines near the reservoir.

[Printed, 9*d*. Drawings. See Repertory of Arts, vol. 12 (*enlarged series*) p. 246; Mechanics' Magazine, vol. 49, p. 183; Patent Journal, vol. 5, p. 293; Engineers' and Architects' Journal, vol. 11, p. 286.]

A.D. 1848, March 8.—N° 12,083.

JOHNSON, WILLIAM BECKETT.—1. Steam engines.

2. Valves and reversing apparatus for marine and other steam-engines. These consist of plates with segmental openings, and caused to rotate with their surfaces in contact.

[Printed, 1*s*. 3*d*. Drawings. See Artizan, vol. 6, p. 275; Patent Journal, vol. 5, p. 389.]

A.D. 1848, March 15.—N° 12,088.

MAUDSLAY, Joseph.—1. Screw propeller. The shanks of opposite blades overlap in the boss and are geared together by sectors, so that as the shaft rotates the blades turn into position, and " when it stops the water places them fore and aft." They may be fixed in either position by a clutch moving on the shaft.

2. Boilers.

(Referred to in Specification of a Patent in 1853, N° 646; see *post*, p. 246.)

[Printed 1*s*. Drawings. See London Journal (*Newton's*), vol. 33 (*conjoined series*), p. 171; Mechanics' Magazine, vol. 49, p. 241, and vol. 53, p. 482; Artizan, vol. 6, p. 276; Patent Journal, vol. 5, p. 408; Engineers' and Architects' Journal, vol. 11, p. 305.]

A.D. 1848, March 22.—N° 12,104.

DAILEY, William James.—A rotary propeller with radiating arms furnished at the ends with broad vanes. Each arm is feathered for a particular part of its revolution by fixed grooved guides acting on tappets on the arm so as to turn it partly round on its axis.

[Printed, 8*d*. Drawings. See London Journal (*Newton's*), vol. 33 (*conjoined series*), p. 414; Artizan, vol. 7, p. 16; Patent Journal, vol. 6, p. 2.]

A.D. 1848, April 4.—N° 12,108.

PILBROW, James.—A tube is laid along a canal and water forced through it under pressure enters nozzle pipes fixed at certain intervals along the tube.

Connected to the boat to be propelled is a receiver or series of open cells, and as these pass near the end of a nozzle pipe a valve is opened which allows the water to impinge on the cells successively, and thus force on the boat and the receiver until they set the next nozzle pipe in action, and close the valve of that which is passed.

[Printed, 11*d*. Drawings. See Artizan, vol. 7, p. 57; Patent Journal. vol. 6 p. 21.]

A.D. 1848, May 26.—N° 12,161.

POOLE, Moses.—The blade of a screw propeller is in the form of the " Bommereng," and consists of a long flat strip bent edgeways nearly at right angles, with a rounded elbow, and one flat end slightly raised while the other is depressed. This bent blade is mounted on a shaft so as to revolve about its centre of gravity. More than one blade may be used.

The two ends revolving in the water work in the thread of the same screw. The pitch may be varied. The surface may be convex, flat, or concave.

[Printed, 8*d*. Drawings. See Repertory of Arts, vol. 13 (*enlarged series*), p. 79; London Journal (*Newton's*), vol. 33 (*conjoined series*), p. 412; Mechanics' Magazine, vol. 49, p. 547, vol. 57, p. 387, and vol. 58, p. 291; Practical Mechanics' Journal, vol. 1. p. 227; Artizan, vol. 7, p. 83; Patent Journal, vol. 6, p. 77; Engineers' and Architects' Journal, vol. 12, p. 23.]

A.D. 1848, May 26.—N° 12,163.

REMINGTON, George.—1. Conversion of rotary into reciprocating motion. A stud or crank-pin traverses a groove in a block at the end of the piston-rod. The direction of the groove is across the line of the reciprocating motion.

2. Reversing apparatus by moving the rod of the excentric from one to another side of the lever working the valve motion.

[Printed, 1*s*. 4*d*. Drawings. See Mechanics' Magazine, vol. 49, pp. 548 and 612; Practical Mechanics' Journal, vol. 1, p. 227; Artizan, vol. 7, p. 82; Patent Journal, vol. 6, p. 77,]

A.D. 1848, June 13.—N° 12,183.

MILLER, John.—"A new system of accelerated menattrite locomotion." When applied to boats it comprises,—1. A frame with wheels for lowering or raising a paddle-wheel at a vessel's stern, and thus regulate the immersion.

2. Feathering paddles. Each float turns on a horizontal axis, and is feathered by a weighted circular ring connected to each float and kept excentric to the wheel by two small wheels grasping its periphery.

3. A "sash paddle" or float in divisions like a window-sash so as to be closed as it dips into the water by the action of certain levers and cylinders.

4. An endless chain moving on a series of wheels forms a roadway by which animals may exert draught power, and thus propel vessels.

[Printed, 4*s*. 6*d*. Drawings. See Mechanics' Magazine, vol. 49, p. 599 Practical Mechanics' Journal, vol. 1, p. 253; Artizan, vol. 7, p. 106.]

A.D. 1848, June 13.—N° 12,185.

BEALE, Joshua Taylor.—1. Steam-engines and pumps.

2. A propeller, with blade similar in action to a screw propeller. Each blade is part of a cylinder from which, the Patentee says, "I cut away certain parts," but exact directions are not given.

3. An apparatus for receiving the thrust of the screw propeller shaft, consisting of a bevilled cogwheel at the end of the shaft gearing into two similar wheels, one on each side. The ends of the shafts of these side wheels work against steel screw points.

4. Incrustation of boilers.

[Printed, 1*s.* 9*d.* Drawings. See Mechanics' Magazine, vol. 49, p. 599; Practical Mechanics' Journal, vol. 1, p. 253; Patent Journal, vol. 6, p. 103.]

A.D. 1848, July 11.—Nº 12,211.

ROSS, Jesse.—1. Agricultural machines.

2. Reciprocating paddles are arranged in a frame worked by two cranks at the side of a vessel, so that the edge of each paddle is always vertical, as it dips into the water, moves through it, and emerges to make the return stroke through the air.

There are two such frames on each side of a vessel, that towards the bow contains twice as many paddles as the other, and moves at half the velocity. Each paddle is caused to feather as it comes out of the water, by being turned on its vertical axis by a lever worked by a revolving cam or grooved wheel.

[Printed, 2*s.* 3*d.* Drawings. Artizan, vol. 7, pp. 132 and 154; Patent Journal, vol. 6, p. 175.]

A.D. 1848, October 12.—Nº 12,282.

HANDCOCK, Elias Robison.—Rotary engines. A hollow annulus, with a piston, rotates, and is attached directly to the paddle-shaft or screw-propeller shaft. One face of the piston bears steam-tight against a stationary circular plate to which the valve apparatus is attached.

The packing is formed of metal, hemp, or asbestos pressed against the cylinder and plates by circular rings, and the operation of the apparatus is explained by the drawings.

[Printed, 10*d.* Drawings. See Mechanics' Magazine, vol. 50, p. 380; Artizan, vol. 7, p. 231; Patent Journal, vol. 7, p. 20.]

A.D. 1848, October 26.—Nº 12,295.

HJORTH, Soren.—" Certain improvements in the use of " electro-magnetism and its application as a motive power, and " also other improvements in its application generally to engines, " *ships, and railways.*"

Electro-magnetic engines are constructed so that each impulse given by the attraction of parts of magnets is succeeded immediately by another, so as to produce a continuous force. A regulator, by presenting more or less surface for conducting a current, regulates the amount of the current. Apparatus for circular and semicircular, as well as for reciprocating motion, are described, but there is no special adaptation of any part of it to marine propulsion.

[Printed, 1*s*. 2*d*. Drawings. See Mechanics' Magazine, vol. 50, pp. 409 and 433; Practical Mechanics' Journal, vol. 2, pp. 59 and 88; Artizan, vol. 7, pp. 121 and 146; Patent Journal, vol. 7, p. 118.]

A.D. 1848, November 29.—N° 12,344.

LANE, John, and TAYLOR, John.—1. Rotary engines, railway-carriage breaks, and brewing.

2. Boats are constructed with elastic ribs, and the thwarts may be removed, so that several boats may be packed one within the other. Cork buoys or rods may be fixed so as to prevent the boat upsetting, as in the outrigger of tbe Catamaran.

3. A vessel's rudder is hung so as to turn on an axis passing through its surface instead of being at the forward edge of it. The parts which project forward of the stern-post are cut so as to allow them to turn clear of the iron straps attaching the pintles to the post. When a screw propeller is used, the rudder turns on a vertical axis, and is wholly forward of the stern-post. The upper and lower parts are united by a bent-iron, so as to allow the shaft of the propeller to pass along between its parts.

[Printed, 3*s*. 2*d*. Drawings. See Mechanics' Magazine, vol. 50, p. 526; Patent Journal, vol. 7, p. 107.]

A.D. 1848, December 2.—N° 12,355.

TAYLOR, James.—1. The cross sections of vessels are elliptical, the ratio of the horizontal to the vertical axis of each ellipse forward and aft of the midship section successively diminishing.

2. A paddle-wheel, with floats of a concave form, between two side rims.

A wheel of this sort is placed in a trough within the vessel, moulded off to a wheel-race sternwards. An air-tight case on the top retains the air as the waves force the water inwards, and admits air from without as the water sinks. A wheel of this kind may be applied at each side of the keel nearly amidships.

[Printed, 11*d*. Drawings. See Mechanics' Magazine, vol. 50, p. 117; Artizan, vol. 7, p. 155; Patent Journal, vol. 6, p. 177; Engineers' and Architects, Journal, vol. 12, p. 81.]

A.D. 1848, December 21.—N° 12,386.

PENN, John.—1. A float raised by water in the condenser regulates the supply of injection water, so that the condenser may not be clogged.

2. Water boiling over by priming falls into a balanced vessel, which, by its rise and fall, regulates the admission of steam through a throttle valve to the cylinder.

3. The expansion gear is moved by a rod on a curved prolonged cam, so that as the rod is moved along the cam the point of the stroke at which the steam is cut off is determined. To enable them to be adjusted so that the engines of an auxiliary power steam-vessel shall have most steam when the speed of the ship is least, the rod governing the expansion is moved along the aforesaid cam by a lever actuated by bellows worked by a paddle-wheel or screw outside the vessel, which is turned by the water at a speed proportional to that of the vessel.

[Printed, 1*s*. 8*d*. Drawings. See Mechanics' Magazine, vol. 50, p. 598; Patent Journal, vol. 7, p. 129.]

A.D. 1849, January 16.—N° 12,420.

MAZELINE, Jean Baptiste François.—1. An equilibrium slide valve.

2. Horizontal steam-engine for a screw propeller. The cylinders lie across the vessel above the propeller-shaft and in a line with each other, or inclined at an angle. Each cylinder has two piston rods, the stuffing-boxes of which are placed so that one rod is to the right and above the other. The rods are attached at the end to a cross piece which works in guides and carries a connecting rod working backwards towards the cylinder and turning a large cog-wheel gearing into a wheel on the propeller-shaft.

[*Printed, 1s. 10d.* Drawings. See Mechanics' Magazine, vol. 51, p. 66, and *vol. 52, p. 121*; Artizan, vol. 7, p. 169; Patent Journal, vol. 7, p. 169.]

A.D. 1849, January 23.—N° 12,433.

SLAUGHTER, Edward.—In marine engines the propeller is moved by a separate engine from that which works the condenser with an air-pump common to both. Eight distinct cylinders move as many cranks on the shaft. Two separate cylinders have the same steam-chest. The air-pumps have annular cylinders and buckets, and they may be caused to work at a slower rate than the engines working the shaft.

A small separate engine is used to drive the screw propeller, so that it may not impede the vessel when she is under sail.

[Printed, 4*d.* No Drawings. See Repertory of Arts, vol. 14 (*enlarged series*), p. 281; Mechanics' Magazine, vol. 51, p. 92; Patent Journal, vol. 7, p. 164.]

A.D. 1849, January 25.—N° 12,440.

PIM, Wakefield.—A screw propeller is applied at the bow similar to that at the stern of the vessel and in conjunction with it.

[Printed, 6*d.* Drawings. See London Journal (*Newton's*), vol. 35 (*conjoined series*), p. 98; Mechanics' Magazine, vol. 51, p. 116; Engineers' and Architects' Journal, vol. 12, p. 300; Patent Journal, vol. 7, p. 164.]

A.D. 1849, February 28.—N° 12,488.

HICK, John, and GRATRIX, William Hodgson.—1. The cylinders of oscillating engines have each two pistons and piston-rods working through opposite ends of the cylinders and turning cranked shafts which drive the main shaft by one or more connecting rods.

2. Screw propeller. Six arms project from the boss and carry six blades, each of which is so bent as to have two distinct angles or pitches.

[Printed, 1*s.* 5*d.* Drawings. See London Journal (*Newton's*), vol. 35 (*conjoined series*), p. 405; Mechanics' Magazine, vol. 51, p. 210; Patent Journal, vol. 7, p. 223.]

A.D. 1849, April 17.—N° 12,576.

REMINGTON, George.—A stud on the piston of a steam-engine works along a groove in a rod where the piston-rod would be, and thus causes it to turn on its axis. Several modifications are shewn. (In page 3, line 18, of the printed specification the words admits air from without as the water sinks. A wheel of this kind may be applied at each side of the keel nearly amidships.

[Printed, 11*d.* Drawings. See Mechanics' Magazine, vol. 50, p. 117; Artizan, vol. 7, p. 155; Patent Journal, vol. 6, p. 177; Engineers' and Architects, Journal, vol. 12, p. 81.]

A.D. 1848, December 21.—N° 12,386.

PENN, JOHN.—1. A float raised by water in the condenser regulates the supply of injection water, so that the condenser may not be clogged.

2. Water boiling over by priming falls into a balanced vessel, which, by its rise and fall, regulates the admission of steam through a throttle valve to the cylinder.

3. The expansion gear is moved by a rod on a curved prolonged cam, so that as the rod is moved along the cam the point of the stroke at which the steam is cut off is determined. To enable them to be adjusted so that the engines of an auxiliary power steam-vessel shall have most steam when the speed of the ship is least, the rod governing the expansion is moved along the aforesaid cam by a lever actuated by bellows worked by a paddle-wheel or screw outside the vessel, which is turned by the water at a speed proportional to that of the vessel.

[Printed, 1*s.* 8*d.* Drawings. See Mechanics' Magazine, vol. 50, p. 598; Patent Journal, vol. 7, p. 129.]

A.D. 1849, January 16.—N° 12,420.

MAZELINE, JEAN BAPTISTE FRANÇOIS.—1. An equilibrium slide valve.

2. Horizontal steam-engine for a screw propeller. The cylinders lie across the vessel above the propeller-shaft and in a line with each other, or inclined at an angle. Each cylinder has two piston rods, the stuffing-boxes of which are placed so that one rod is to the right and above the other. The rods are attached at the end to a cross piece which works in guides and carries a connecting rod working backwards towards the cylinder and turning a large cog-wheel gearing into a wheel on the propeller-shaft.

[Printed, 1s. 10d. Drawings. See Mechanics' Magazine, vol. 51, p. 66, and *vol. 52, p. 121*; Artizan, vol. 7, p. 169; Patent Journal, vol. 7, p. 169.]

A.D. 1849, May 31.—N° 12,625.

DUGDALE, John, and BIRCH, Edward.—In a channel under a vessel a horizontal shaft revolves by the action of a diagonal shaft connected to it by a universal joint.

The shaft carries one or more screw propellers, each of them being larger as they are nearer the stern.

[Printed, 9*d*. Drawings. See Mechanics' Magazine, vol. 51, p. 545; Patent Journal, vol. 8, p. 115.]

A.D. 1849, June 2.—N° 12,627.

TREWHITT, Henry, and CRAMPTON, Thomas Russell.—1. Locomotive engines on land.

2. Disconnecting propeller-shaft. The end of one of the divided portions of the shaft is cut into a left-handed screw and a strong circular disc travels on this. A crank turns easily on the other portion of the shaft, but a collar prevents it from going far from the end. The boss of this crank corresponds with the disc on the other shaft, and as the engine is turned ahead the crank and disc are screwed more tightly together. A key put through the crank and shaft will prevent them from disconnecting when the engine is turned astern; but when it is desired to disconnect the shaft, the key is removed and the disc unscrewed.

3. Counterbalancing the unbalanced parts of marine engines by fixing weights so as to revolve opposite to them.

[Printed, 9*d*. Drawings. See London Journal (*Newton's*), vol. 36 (*conjoined series*), p. 86; Mechanics' Magazine, vol. 51, p. 546; Patent Journal, vol. 8, p. 127.]

A.D. 1849, June 20.—N° 12,663.

CAMPBELL, Alexander Francis.—1. Agricultural implements and steam boilers.

2. Screw propeller. Directions are given for constructing the blades of screw propellers, but the precise form depicted in the drawings of the blades is not explained.

3. Air is forced out under water to propel a vessel by a steam-engine acting directly on an air-pump.

4. Leeboards are furnished with rudders to act with or without the usual rudder.

[Printed, 3*s*. 5*d*. Drawings. See Mechanics' Magazine, vol. 51, p. 616. Patent Journal, vol. 8, p. 200.]

A.D. 1849, July 4.—N° 12,690.

WILDING, WILLIAM HENRY.—1. Machinery for converting rotary into reciprocating motion, and *vice versâ*, and for multiplying gear.

2. Feathering paddles. Each float turns on its own radial axis, and is feathered by a rod from an elbow on the float, which takes into a stationary grooved piece. In another plan, the float turns on an axis parallel to the shaft, and is feathered in a similar manner.

(The Patent is referred to in the Specification of a Patent in A.D. 1853, N° 2258; see *post*, p. 255.)

[Printed, 1*s*. 6*d*. Drawings. See Mechanics' Magazine, vol. 52, pp. 38 and 41.]

A.D. 1849, July 18.—N° 12,708.

LEIGH, EVAN.—Steam-engines. The steam is admitted to oscillating engines through flexible tubes instead of hollow trunnions. Four steam cylinders, working expansively, work the same shaft.

The expansion valve is worked by an excentric distinct from that which works the slide valve, and the relative motions of these two excentrics can be adjusted. This is done by connecting the excentrics through the means of an intermediate wheel, carrying pinions, by which one of the excentrics (fixed on the strap) moves the other, otherwise loose upon it. This intermediate wheel may be turned round by a worm, and will then alter the relative positions of the excentrics, though their motions will be corresponding as before. Other improvements in steam-engines are explained.

2. Boilers and furnaces.

3. The paddle-wheel or propeller on each side of a vessel is worked by a separate engine, and by the means already described, or otherwise, each engine may be stopped or its speed reduced, so as to steer the vessel.

[Printed, 1*s*. 7*d*. Drawings. See London Journal (*Newton's*), vol. 36 (*conjoined series*), p. 289; Mechanics' Magazine, vol. 52, p. 76; Patent Journal, vol. 8, p. 209.]

A.D. 1849, August 9.—N° 12,737.

HOLDSWORTH, ARTHUR HOWE.—1. A jacket round the funnel of a steamboat forms a small space, which is kept full of water.

2. The doors of furnaces of marine engines are made of double casing, and water admitted into them through the hinges, made

hollow for that purpose. A wheel running on the floor supports the heavy corner of the door when it is opened.

[Printed, 5*d*. Drawings. See Repertory of Arts, vol. 15 (*enlarged series*), p. 214; London Journal (*Newton's*), vol. 36 (*conjoined series*), p. 96; Mechanics' Magazine, vol. 52, p. 139; Patent Journal, vol. 8, p. 247.]

A.D. 1849, August 10.—N° 12,739.

RUTHVEN, John.—Water admitted through apertures below a vessel flows along a passage to a centrifugal wheel, with curved blades, by which it is forced through pipes terminating in nozzles outside the vessel.

The nozzles are jointed, so that they may be turned in any direction, and thus the motion of the vessel may be regulated in amount and direction without stopping the engines.

[Printed, 1*s*. 10*d*. Drawings. See Mechanics' Magazine, vol. 52, p. 138; Patent Journal, vol. 8, p. 271.]

A.D. 1849, September 13.—N° 12,769.

GRIFFITHS, Robert.—1. The connecting rod of an engine drives the shaft of a screw propeller, by a "sun and planet" motion, so that one complete stroke of the piston gives more than one revolution of the shaft. In order more readily to pass the "dead point" when a single engine is used, a cylinder, at right angles, has a piston, moved inwards when the piston of the steam engine is at half stroke, so as to condense air in the second cylinder; which air, by its elasticity, urges the piston of the second cylinder to press the crank or sun and planet motion past the dead point.

2. To indicate the intensity of the currents at various points in the neighbourhood of the screw propeller, and thus to show the curve best adapted for the blades of the screw, there are several small spheres, actuated by the water, and connected with cords attached to spring balances, by which the pressure upon each is indicated.

3. Screw propeller. Each blade may turn on its axis in a socket within the box, and the pressure of the water on the leading side of the blade moves lever arms within the box, so as to press forward a moveable sliding piece, the resistance of which is regulated by a spring. By this means the pitch of the blade is increased when the velocity is increased by the diminished resistance presented as the vessel moves rapidly through the water with a favourable wind, and the pitch is diminished as the speed of the propeller is diminished.

The centre portion of the boss is filled up with a spherical or egg-shaped case.

4. Various forms of blades of propellers. In one, each blade is inclined, so that its outer end is bent towards the bow of the vessel. In another the blade is open at the centre. In another case two blades are bent forward and two backwards. In another the blades are tapered towards their outer ends.

(This Patent is referred to in the Specification of a Patent in A.D. 1853, N° 492; see *post*, p. 244.)

[Printed, 1*s*. 3*d*. Drawings. See Repertory of Arts, vol. 15 (*enlarged series*), p. 220; Mechanics' Magazine, vol. 52, p. 219, vol. 57, p. 261, and vol. 58, p. 187; Artizan, vol. 10, pp. 176 and 219; Patent Journal, vol. 8, p. 295.]

A.D. 1849, October 18.—N° 12,815.

CAMPBELL, Ethan.—1. An engine for obtaining and using the vapour of alcohol, and other like vapours, for producing motive power. This is explained minutely and at length, and comprises a separate furnace heating water, which in its turn heats the vapour of alcohol, and a condenser for the vapour, which is condensed by a circulating current of water, and is returned into the boiler through a feeding apparatus.

2. Pistons like the plungers of pumps, with butterfly valves, are worked by the above-mentioned engine, so as to discharge water through horizontal tubes, opening under water at the stern of a vessel, which is thereby propelled. Another opening is used, through which the water is discharged in a forward direction when sternway is to be given to the vessel.

[Printed, 2*s*. 8*d*. Drawings. See Mechanics' Magazine, vol. 52, p. 338; Patent Journal, vol. 9, p. 29.]

A.D. 1849, November 2.—N° 12,829.

BUCKWELL, William, and APSEY, Joseph.

1. Steam-engines.

2. Conical propellers. Inclined surfaces of a pyramidal or triangular form are fixed to a revolving cone; but the precise form or action is not intelligibly described or explained by drawings.

[Printed, 5*d*. No Drawings. See Repertory of Arts, vol. 15 (*enlarged series*), p. 370; Mechanics' Magazine, vol. 52, p. 377; Patent Journal, vol. 9, p. 59.]

A.D. 1849, November 24.—N° 12,860.

CALLAWAY, George, and **PURKIS**, Robert Alleé.—1. Water is discharged through tubes under a vessel by the action of centrifugal wheels, with curved vanes rotating on horizontal axes, and thus the vessel is propelled.

2. The discharge pipes may be turned to one side or another of the line of the keel by quadrant pieces acted upon by wheels turned like the tiller wheel, so as to steer the vessel by determining the direction in which it is discharged.

3. Apparatus for ploughing land.

[Printed, 1*s.* 1*d.* Drawings. See Mechanics' Magazine, vol. 52, p. 437; Practical Mechanics' Journal, vol. 3, pp. 106 and 259; Patent Journal, vol. 9, p. 117.]

A.D. 1850, February 21.—N° 12,973.

HEDIARD, Aléxandre.—A piston works water-tight in a horizontal tube under water near a vessel's keel, and propels the vessel by the action of a plunger attached to the end of the piston.

This piston projects so far sternward from the piston that the end always acts on the water beyond the tube, and is not withdrawn into the tube. The inside part of the tube opens to a vertical tube, which is open to the air on deck. A shutter may close the outer end of the lower tube to allow of repairs being made.

[Printed, 10*d.* Drawings. See Mechanics' Magazine, vol. 53, p. 159; Patent Journal, vol. 9. p. 273.]

A.D. 1850, April 5.—N° 13,031.

PHIPPS, George Henry.—1. The stern of a vessel is altered in form so as to resemble what it would be if the upper part of the hull, cut off by a horizontal section above its light draft waterlines, were moved astern on the lower part. As the run of the lower part is thus terminated forward of that of the upper part, a screw propeller so attached to the stern-post of the lower part as to work well when the vessel is at light draught will not be impeded by the upper or projecting counter touching the water.

2. The external bearing of a screw-propeller shaft is made moveable so that the propeller is raised or lowered to suit the draught of water of the vessel. The shaft is formed of two parts connected by a universal joint.

[Printed, 1*s.* 8*d.* Drawings. See Mechanics' Magazine, vol. 53, p. 299 Patent Journal, vol. 10, p. 9.]

A.D. 1850, April 15.—N° 13,039.

HEINDRYCKX, FLORIDE.—A screw-propeller is constructed by "mounting two or more elastic inclined vanes or wings on an "arm or arms fixed or attached transversely" to a shaft. In the drawing one form is represented, in which each vane is a rectangle, with one corner at the boss, and the shorter side attached to an arm inclined towards the vessel's bow.

[Printed, 5*d*. Drawings. See London Journal (*Newton's*), vol. 40 (*conjoined series*), p. 359; Mechanics' Magazine, vol. 53, p. 218; Patent Journal, vol. 10, p. 67.]

A.D. 1850, June 1.—N° 13,095.

TUCKER, JOHN.—1. Steam boilers.

2. Screw propeller. The propeller shaft passes at one side of the stern-post, so that the rudder can be turned to either side, and it has a notch on one side to clear it of the screw.

The propeller is carried on a vertical arm fixed to a horizontal shaft above the other shaft, and by disconnecting the propeller shaft by unscrewing it from the propeller, the propeller is free to be turned up out of the water, being borne on the upper shaft.

Iron belts are fixed to the outer edges of the blades of the screw to secure it from injury and from fouling.

3. Apparatus for cleaning a vessel's bottom.

(The references F, F, at p. 3, line 1, seem to indicate the parts marked E, E, in the drawing.)

[Printed, 1*s*. 4*d*. Drawings. See Mechanics' Magazine, vol. 53, p. 478; Patent Journal, vol. 10, p. 117.]

A.D. 1850, June 12.—N° 13,131.

STOPPORTON, JOHN.—Pistons act in tubes under a vessel, to propel it by discharging the water towards the stern. A lubricator oils the pistons. The tubes may be used as condensers for the steam-engines which work the pistons.

[Printed, 9*d*. Drawings. See Mechanics' Magazine, vol. 53, p. 495.]

A.D. 1850, June 19.—N° 13,136.

GREENWAY, CHARLES.—"Improvements in ships' and other "pumps, in anchors, and in propelling vessels." By a Disclaimer *filed 19th December* 1850, the Patentee disclaims that part of the title contained in the words "and in propelling vessels," and inserts the word "and" after the word "pumps."

[Printed, 7*d*. Drawings. See Repertory of Arts, vol. 17 (*enlarged series*), p. 47; London Journal (*Newton's*), vol. 38 (*conjoined series*), p. 34; Mechanics' Magazine, vol. 53, p. 517; Patent Journal, vol. 10, p. 151.]

A.D. 1850, June 19.—N° 13,138.

HANSON, CHARLES.—1. Steam engines.

2. A moveable frame is worked back and forward under water, and carries vanes pivotted at both ends, and caused to feather for the return stroke by the action of slides with grooves, which work pins on the ends of the vanes.

[Printed, 2*s*. 10*d*. Mechanics' Magazine, vol. 53, p. 517; Patent Journal vol. 10, p. 177.]

A.D. 1850, June 19.—N° 13,141.

BALDWIN, ETHAN.—1. Steam engines.

2. "A helical plane submerged propeller." A circular plane divided along a radius is drawn on a shaft so as to form a screw.

3. The shaft of a rotary engine is geared to the propeller shaft by straps at both ends of the engine.

[Printed, 2*s*. Drawings. See Mechanics' Magazine, vol. 53, p. 515; Patent Journal, vol. 10, p. 179.]

A.D. 1850, June 20.—N° 13,144.

MALO, GASPARD.—1. Screw propeller. A single or double blade is fixed on the shaft, and another hollow shaft surrounding the first carries another blade further forward than the first. A third hollow shaft with a blade may be added in a similar manner.

All the ends of the shafts come through the bearings inside the vessel, and when it is desired to place the blades upright to give little obstruction for sailing, the several shafts carrying them are turned round until each set of blades is vertical.

2. The propeller works in bearings set independent of the stuffing-box, which does not project into the recess in the sternpost. The bearing is supported by sliding supports between which and the shaft are moveable pieces fixed by a wedge.

3. The opening in the deadwood is strengthened by an iron frame in one piece firmly fixed.

4. Tanks carrying fresh water to be used during the first part of the voyage are employed to hold w[illegible] and

the waste hot water from the air-pump, so as to dispense with the need of boring holes through the hull under water.

[Printed, 1*s*. 5*d*. Drawings. See Mechanics' Magazine, vol. 53, p. 518, and vol. 54, p. 301; Patent Journal, vol. 10, p. 140.]

A.D. 1850, September 5.—N° 13,246.

COCHRANE, WILLIAM ERSKINE, and FRANCIS, HENRY.—1. At each side of a vessel an oar is hung by the upper part, and moved in the arc of a circle to and from the vessel while its blade feathers by the action of the water upon its unequal sides.

2. Rudders. In one form the rudder is mounted on a pivot at the keel of the vessel, and part of its surface is forward of this pivot. In another, a rudder like an oar is used on each quarter, and is mounted on bearings only at the upper part inside the vessel.

3. Steam-engines and railway sleepers.

[Printed, 1*s*. 6*d*. Drawings. See Mechanics' Magazine, vol. 54, p. 216; Patent Journal, vol. 10, p. 258.]

A.D. 1850, November 2.—N° 13,308.

SLATE, ARCHIBALD.—1. To transfer canal boats from one level to another, they are floated into hollow caissons, which are lifted and transferred across the edge of the chamber containing them, so as to be lowered into one of another level.

2. Compressed air conducted along flexible tubes escapes under water from below each of a train of boats so as to propel them.

[Printed, 1*s*. 4*d*. Drawings. See Mechanics' Magazine, vol. 54, p. 376; Patent Journal, vol. 11, p. 61.]

A.D. 1850, November 12.—N° 13,340.

WIMSHURST, HENRY.—1. Rotary steam-engines.

2. Screw propellers. The propeller-shaft passes out parallel with the keel, but on one side so as to allow the rudder to swing. A joint on the shaft allows the after part to be raised by a rack-work or screw which lifts it out of its bearings and hoists the screw out of the water. In some cases the outer end of the shaft is suspended by an outrigger attached to the stern of the vessel.

3. Screw propeller. This is placed on a shaft across the vessel near the bows, and the blades are fitted so as to turn on their ends in the boss by the action of the rods moving a small arm on each blade. The revolution of this propeller turns the vessel's head to one side or the other.

4. Apparatus for measuring the power exerted in turning the shaft of a screw-propeller. The shaft is in two parts, which may usually work together by feathers, but when the power exerted is to be measured the engine-shaft turns the other part through intervening friction rollers between a bevelled surface attached to each part of the shaft. The pressure required to cause these surfaces to hold is given by a lever which moves at the larger end a spring balance, and this indicates the power exerted.

5. The parts of the shaft are detached by moving two disconnecting bolts, and by a large toothed-wheel on the shaft turned by two pinions the shaft may be slowly turned round.

6. The bow-steering screw propeller works in an aperture or trunk in the bow or forebody.

7. The run or stern-post is formed of iron plates.

[Printed, 3*s*. 7*d*. Drawings. See Mechanics' Magazine, vol. 54, p. 413, and vol. 55, pp. 281 and 301; Patent Journal, vol. 11, p. 136.]

A.D. 1851, January 11.—N° 13,451.

BARLOW, Charles.—Paddle-wheels. " First, having the " paddle or buckets of a curved winding form set obliquely " between the two rims of one section of the paddle-wheel; " second, in forming the wheel of two sections, with paddles " exactly alike, but set opposite to one another on the two sections, " leaving a space between all around the circumference of the " wheel."

[Printed, 5*d*. Drawings. See London Journal (*Newton's*), vol. 40 (*conjoined series*), p. 366; Mechanics' Magazine, vol. 55, p. 74; Patent Journal, vol. 11, p. 193.]

A.D. 1851, January 30.—N° 13,476.

WOODCROFT, Bennet.—Screw propellers. 1. To set the blades at a desired angle, there is a toothed-wheel on a hollow shaft outside the propeller-shaft and working a pinion, and a worm and wheel movement attached to each blade, so that the blade turns on its axis in the boss as the hollow shaft is turned round.

2. Each blade has upon its axis a crank with a link working by a joint in a grove round a sliding box on the propeller-shaft. By sliding this box back or forward on the shaft (with which it rotates, held by a key) the blades may be set to any required angle, and they are kept in position by a break or friction-piece

forced against each blade by another sliding box on the other side of the propeller.

3. Each of the blades has a separate sliding box, so that by moving the sliding boxes while the blades are stationary in a vertical position, the ship may be steered if she has lost her rudder.

The worm-wheel motion described above may be replaced by a rack moved along the shaft by a sliding box, and turning the blade by a pinion on the axis of the blade.

4. The last-mentioned arrangement is modified by causing the rods moving the blades to work in groves along the shaft, and thus enter the vessel where these ends are received round a groove on a box not revolving with the shaft, but capable of being slid along it. The blades may thus be turned so far round as to cause them to back the vessel, while the propeller always revolves in the same direction. The grooves may be altered in relative position also by moveable switches, and thus by fixing the box and altering the grooves the action of the rods on the propeller blades may be regulated, so that the broad side of each blade will meet the water in one part of its revolution, and the sharp edge in the other part, by which means the vessel may be steered.

The blades may be turned so far round edgeways as to fill up the aperture in the dead-wood when the propeller is at rest. In such a case if the blades are so broad that they overlap the stern-post and rudder-post, there may be cut into each or both of these posts a groove in which the surface of the blade will rest.

[Printed, 9½*d*. Drawings. See Repertory of Arts, vol. 18 (*enlarged series*), p. 131; Mechanics' Magazine, vol. 55, p. 118; Patent Journal, vol. 11, p. 216.]

A.D. 1851, February 17.—N° 13,515.

BUCHHOLZ, GUSTAV ADOLPH.—1. Cogged wheels.

2. Anti-friction rollers.

3. A machine caused to move by a pressure which "shall remain "stationary in position."

4. Screw propellers. There are three screw propellers so geared with wheels as to move together. The axes are on the same level, and the middle one is nearer the stern than the others.

Each propeller axis is mounted in a ring which can turn on a vertical axis, so that the direction of the shafts of all the propellers may be altered at once by wheel work, and thus steer the vessel.

[*Printed, 0s. 5d.* Drawings. See Mechanics' Magazine, vol. 55, p. 158.]

A.D. 1851, April 30.—N° 13,610.

LUND, Henry.—Arms furnished with broad blades are caused to swing through a small arc under water at the stern and near the midships of a vessel. The blades are feathered by the action of numerous wheels, screws, levers, and other contrivances minutely described.

(This Patent is referred to in the Specification of a Patent in A.D. 1854, N° 1953; see *post* p. 266.)

[Printed, 1*s*. Drawings. See Mechanics' Magazine, vol. 55, p. 378; Patent Journal, vol. 12, p. 62.]

A.D. 1851, May 13.—N° 13,632.

CARPENTER, Edward John.—Screw propellers. The after-part of a vessel has the deadwood and stern-post replaced by two keels and stern-posts, with a long space between them. A screw propeller works in each stern-post, one propeller in advance of the other, so that their blades overlap. One of the screws may be worked while the aperture for the other is filled up.

2. The blades are " part flat and part curved " in form.

3. The propeller may be hoisted out of the water along grooves in the stern-post by means not particularly described.

[Printed, 10*d*. Drawings. See Mechanics' Magazine, vol. 54, p. 461, vol. 55, p. 401, and vol. 58, p. 96; Patent Journal, vol. 12, p. 100.]

A.D. 1851, August 28.—N° 13,729.

M'CONNELL, James Edward.—1. A mode of making pistons and piston-rods of malleable iron or steel. The packing rings are kept to their places, and pressed to the cylinder by a continuous undulating spring.

2. Steam-engines and boilers especially for locomotives.

3. A mode of thickening a straight tubular axle.

4. Casing a solid iron axle with steel.

[Printed, 4*s*. 4*d*. Drawings. See Mechanics' Magazine, vol. 56, p. 198.]

A.D. 1851, September 4.—N° 13,736.

DRAKE, John Poad.—1. Improvements in the construction of iron and wooden vessels.

2. Apparatus for raising and lowering the paddle-shaft to suit different draughts. (See Sheet 21 of the Drawings.) The shaft

is raised by screws, and the connecting-rod is screwed out or in at the crosshead so as to correspond in length.

In another plan the shaft is in one arm of a wheel, which may be turned round by pinions, so as to alter the height of the shaft.

3. Feathering paddles. Each float hangs on horizontal hinges, and moves freely between two stops set at an angle. Modifications of this plan are shown.

4. Auxiliary paddle-wheel, one half of which has folding arms, secured, when needful, by chains from one to the other.

5. Drum paddle-wheels, with floats of various shapes.

6. Engine, with frame partly of wood.

7. Dividing the shaft to allow one wheel to be worked separately. The details are not particularly described.

[Printed, 10*s.* 4*d.* Drawings. See Mechanics' Magazine, vol. 56, p. 217.]

A.D. 1851, September 4.—N°. 13,738.

DUNCAN, John Wallace.—1. Engines for impelling purposes.

2. A temporary propeller is formed by a band furnished with numerous small vanes or "fins," of gutta percha projecting diagonally from its surface.

A copper trough is placed round the vessel, and the band is thus directed as it traverses the deck so that the fins act diagonally on the water as they go down one side and come up the other.

Other modifications are shown for driving similar bands on shafts below water, to act as screw propellers.

3. Machinery for gutta percha.

[Printed, 2*s.* 4*d.* Drawings. See Mechanic's Magazine, vol. 56, p. 237.]

A.D. 1851, October 17.—No. 13,779.

ROBERTS, Richard.—1. Machinery for regulating and measuring the flow of fluids, and for pumping, forcing, agitating, and evaporating fluids, and obtaining motive power from fluids.

2. Screw propeller (see p. 11 of the printed Specification, and Figs. 24, 25, 26 of the Drawings). The improvements consist "in making the boss of screw propellers much larger than usual, in "order that the vanes may act more effectively on the water, and in "extending the bosses backwards far enough to admit of their being "*tapered* or otherwise formed so as to allow the water to close upon "*them without* a counter current being produced." The diameter

of the boss is at least one-third that of the "propeller wheel," and the width of the arms about one-sixth the diameter of the propeller. The end of the boss astern of the propeller comes to a curved conical point, and forward of the propeller it is "softened "off into the body of the vessel."

(This Patent is referred to in the Specification of a Patent in A.D. 1852, N° 14,130; see *post*, p. 231.)

[Printed, 3*s*. Drawings. See Mechanics' Magazine, vol. 56, p. 338.]

A.D. 1851, November 6.—N° 13,805.

THOMAS, WILLIAM.—1. Steam engines and water-wheels.

2. On the paddle-shaft is a fly-wheel with weighted pieces, which are moveable along the arms.

3. Disconnecting paddle-shaft. The crank pin works at one side in a disc turning on the shaft, and caused to hold to it or be relaxed, and move separately by a brass cushion pressed inwards by a key that may be moved by strokes from a hammer.

4. Air compressed into reservoirs works engines which turn the propeller-shaft.

[Printed, 2*s*. 9*d*. Drawings. See Mechanics' Magazine, vol. 56, p. 399.]

A.D. 1851, November 20.—N° 13,820.

BRAMWELL, FREDERICK JOSEPH.—1. Steam-engines.

2. Paddle-wheels. Each float is upon an arm which is attached to a pin fixed outside the wheel on the framing, and excentric to the shaft. The arm works in and out of the rim of the wheel (which is in the form of a drum) on friction rollers, and by the revolution of the wheel the floats move more quickly during the latter part of their action upon the water.

In another similar plan the wheel is formed with arms attached by links to each float fixed on an arm radiating from an excentric pin as before.

3. Feathering paddles. Each float turns on a horizontal axis carried on arms, the inward ends of which turn on the rim of a band, embracing a wheel placed excentrically, as before. The outer edge of each arm is worked by a link-rod from a point at the end of an arm of the wheel on the shaft, and thus the float is both feathered and caused to move more rapidly towards the latter part of its stroke in the water.

4. This accelerated motion of the floats is accomplished by causing them to yield during the first part of their stroke, and to compress a spring, the rebound of which urges them against the water during the remainder of the stroke.

[Printed, 2*s.* 1*d.* Drawings. See Mechanics' Magazine, vol. 56, p. 437.]

A.D. 1851, November 22.—Nº 13,831.

MILLS, GEORGE.—1. Boilers.

2. The engines for a screw-propeller have horizontal cylinders inclined to each other at an angle, and turning a vertical shaft with a large bevilled wheel upon it gearing into a smaller wheel on the propeller-shaft. The arrangement represented in Drawing 3 *b* seems to consist of cylinders working a horizontal shaft with cogged wheels upon it gearing into wheels on the propeller-shaft.

[Printed, 2*s.* 10*d.* Drawings. See Mechanics' Magazine, vol. 56, p. 439, also vol. 57, p. 201.]

A.D. 1851, November 27.—Nº 13,835.

STEVENS, JOHN LEE.—" Paddle-wheels with diagonal float-
" boards so fixed and arranged that the alternate float-boards
" overlap or project beyond the ends of the next float-boards on
" either side of the wheel, leaving spaces between the succeeding
" float-boards at either end thereof."

[Printed, 6*d.* Drawings. See Mechanics' Magazine, vol. 56, p. 459.]

A.D. 1851, December 4.—Nº 13,840.

MACINTOSH, JOHN.—" Improvements in steam-engines in
" rigging and propelling vessels, and facilitating their progress
" through the water."

1. Rotary engines.

2. Masts which may be inclined so as to cause the sails to exercise a lifting power.

3. Glutman's material for paying the bottoms of vessels.

[Printed, 1*s.* 2*d.* Drawings. See Mechanics' Magazine, vol. 56, p. 476.]

A.D. 1851, December 8.—Nº 13,851.

LAKE, JOHN.—Boats are propelled on canals by wheels on each side, moved by a steam-engine on board, and working on iron ribs *fixed like rails* upon walings supported on piles and extending on *one or both* sides of the canal throughout its entire length.

Instead of rising by locks the boats move up inclined planes while rollers at the bottom support part of their weight, and the wheels that propel the boats gear into racks on the walings.

[Printed, 1*s.* 10*d.* Drawings. See Mechanics' Magazine, vol. 56, p. 198, also vol. 57, pp. 1, 30, and 384.]

A.D. 1852, January 31.—N° 13,944.

HEDIARD, Alexandre.—Water received through an orifice under a vessel is discharged through another on an elbowed tube which may be turned in any direction so as to propel and steer the vessel.

[Printed, 7*d.* Drawings. See Mechanics' Magazine, vol. 57, p. 138.]

A.D. 1852, January 31.—N° 13,945.

REED, Joseph Haythorne.—Two vertical shafts, close together, one on each side of the keel carry horizontal arms below a vessel, and cause vanes on the arms to swing through an arc fore and aft while the vanes feather during the return stroke by turning on their pivots in conjunction with stops which may be altered in position so as to back the vessel.

[Printed, 9*d.* Drawings. See Mechanics' Magazine, vol. 57, p. 138.]

A.D. 1852, May 4.—N° 14,114.

BROOMAN, Richard Archibald.—Paddle-floats. The floats are placed obliquely, and besides this one end of each float is further from the shaft than the other.

Two floats, obliquely placed, may cross each other.

Each float may be divided into one or more parallel pieces, and the surfaces may be curved.

[Printed, 9*d.* Drawings. See Mechanics' Magazine, vol. 57 pp. 401 and 415.]

A.D. 1852, May 22.—N° 14,130.

ROBERTS, Richard.—1. Construction, rigging, ventilation, and loading of vessels; marine engines, life-boats, anchors, guns.

2. Screw propeller. The vanes are separately attached to a boss, the after end of which tapers away nearly to a point. A flat washer on the shaft is substituted for the stuffing-box.

Several propellers on shafts parallel to each other are worked so that each *shaft turns* in an opposite direction from the next, and the vanes overlap those of the propeller on either side. The propellers are mounted on a swing frame, so that their position may be regulated according to the immersion of the vessel.

3. " Trimming fins " or boards along the sides of a vessel, which may be set at any angle.

[Reference is made to a Patent in A.D.1851, N° 13,779; see *ante*, p. 228.]

(The part marked 9 in Drawing 46 (Sheet 4) is that referred to by the letter *q*, at p. 13, line 36.)

[Printed, 3*s*. 3*d*. Drawings. See Mechanics' Magazine, vol. 57, p. 437.]

A.D. 1852, June 1.—N° 14,150.

NEWTON, ALFRED VINCENT.—Marine engines are arranged with the cylinders in lines fore and aft. The upper and lower cylinders have their open ends turned to each other in pairs. The pistons in both opposite cylinders are connected by vertical rods. The working beam of each of the two sets of cylinders oscillates in a vertical arc, reaching partly into the open cylinders, and has an arm carrying a connecting rod to work the engine crank.

2. Caloric engines so arranged as to draw the heated air from the top of the engine-room, while a supply of fresh air is admitted at the bottom.

[Printed, 10*d*. Drawings. See London Journal (*Newton's*), vol. 42 (*conjoined series*), p. 194; Mechanics' Magazine, vol. 57, p. 477.]

A.D. 1852, June 28.—N° 14,192.

CROOKER, MATTHEW AUGUSTUS.—At each side of a vessel a frame carries a shaft with a three-throw crank working paddles on levers.

By a groove and studs in conjunction with rods from the cranks each paddle in succession is caused to act on the water, and bent backward so as to leave the water and return through the air for the next stroke.

[Printed, 5*d*. Drawings. See Mechanics' Magazine, vol. 58, pp. 1 and 37.]

A.D. 1852, July 29.—N° 14,242.

WINTER, FREDERICK.—1. A vessel is propelled by paddles attached to an endless chain turning round two wheels in the water. Each paddle is attached to a link of the chain on each side.

2. Land carriages and water-mills.

[Printed, 5d. Drawings. See Mechanics' Magazine, vol. 58, p. 138.]

A.D. 1852, August 19.—N° 14,263.

LOWE, James, and WYCHE, Thomas Eyre.—Screw propeller. The form and relative dimensions of each part are represented in drawings, and given minutely in numerical figures.

" In the propeller constructed according to our invention of " two blades, the surfaces of the blades are no portion of a screw, " the lines of junction with the boss, and the surfaces of the blades " are in planes crossing each other, and the outer edges are not in " a line with each other, but the central portions of each blade are " in the same line, and a straight line may be drawn passing through " each blade and the centre of the boss or axis, when the blades " are opposite and transverse to each other."

[Printed, 7*d*. Drawings. See Mechanics' Magazine, vol. 58, p. 196.]

A.D. 1852, September 16.—N° 14,291.

SANG, Frederick.—A vessel is supported on two or more hollow drums, which are furnished with projecting vanes so as to serve as paddle-wheels when turned round. In another plan the vessel is supported on an endless chain of caissons, which propel her by acting on the water as they pass over a wheel at each end of the vessel, and are carried on rails through the air.

[Printed, 7*d*. Drawings. See Mechanics' Magazine, vol. 58, p. 256.]

A.D. 1852, October 14.—N° 14,323.

CARTER, Thomas. A piston reciprocates in a tube under water beneath a vessel, and is caused to turn edgeways for the return stroke by certain catches working on discs attached to the piston. The action of the catches may be varied by a system of rods, under the control of the steersman, so that the vessel may be propelled forwards or backwards, or stopped without stopping the engines.

(This is the Abridgment of the Specification of the last Patent relating to Marine Propulsion granted under the " old law," which law expired in October 1852.)

[Printed, 9*d*. Drawings.]

A.D. 1852, October 1.—N° 32.

FLYNN, William Pym.—Paddle-floats. Each float is not a rectangle, but the outer edge is inclined or cut into angles. Th float overlaps the next at one end, and is overlapped at the other. The wider part of each alternate float is near the vessel, and the edge of the float is inclined on one side and on the other alternately.

[Printed, 2½*d*. No drawings.]

A.D. 1852, October 1.—N° 101.

ALLAN, Thomas.—Carbonic acid generated in a tube is heated or exploded by a furnace, so as propel a vessel by direct action through a tube opening below the external water.

[Printed, 2½*d*. No drawings.]

A.D. 1852, October 1.—N° 106.

ALLAN, Thomas.—1. Paddle-wheels. The arms or spokes are made of springs.

2. Screw propeller. The blades are of elastic pieces, like a fish's tail.

3. Locomotive engines.

[Printed, 3½*d*. No drawings.]

A.D. 1852, October 2.—N° 155.

BROWN, David Stephens.—A vessel with an inclined plane at the bottom, or below it, or out of the water, is to be partly supported by the oblique action of the air or water on the plane.

The vessel may be propelled by air forced out under water, by kites, balloons, paddles, screws acting on the air, or planes with valves reciprocating on horizontal axes.

[Printed, 5½*d*. Drawings.]

A.D. 1852, October 2.—N° 160.

BURCH, Joseph.—1. Screw propeller. Instead of a boss, the central part of the propeller is a large flat hollow disk, from which the blades project radially.

The buttock lines of the vessel are brought to a form which is circular in vertical section, close to which plane the disk revolves.

The lines are still continued astern of the disk, so as to taper conically to a point at the stern-post; and an aperture is cut in the vessel above the opening for the disk, to allow the ends of the blades to pass, if they are wider than the disk. The blades may be protruded and withdrawn by screws, acting on their arms in sliding pieces within the hollow disk. The disk may be wide enough (fore and aft) to allow the blades to be withdrawn into it without altering the angle of each on its radial axis.

In other cases the disk may be narrower, and each blade is turned on its axis, so as to be feathered for withdrawing into the disk. The blades without being thus drawn into the disk may be caused to feather their edges, when at rest, for sailing, or in a tideway. The blades are turned by screws or wheels, actuated by a shaft within the hollow propeller shaft. The revolution of the disk will expel the water near the shaft; and tubes are to admit air to this space, so as cause the propeller disk to work in air.

2. Construction of vessels.

[Printed, 2*s*. 0½*d*. Drawings.]

A.D. 1852, October 4.—N° 199.

BATES, Edwin.—(The Patent is void from want of notice to proceed.) A propeller, formed of a ball, with blades shaped in a manner not described.

[Printed, 2½*d*. No drawings.]

A.D. 1852, October 4.—N° 211.

SCOTT, Thomas.—1. A vessel is propelled by pistons reciprocating in tubes under water. They may be furnished with valves, and are worked by the pressure of water, acting through tubes, on a cylinder and piston so as to transmit power obtained from a steam-engine.

2. Locomotive engines.

[Printed, 1*s*. 9½*d*. Drawings.]

A.D. 1852, October 5.—N° 218.

CLARK, William.—(The Patent is void from want of notice to proceed.)

Screw propeller. Each blade has two degrees of pitch at different parts. Near the periphery the pitch is greater to act for propulsion, and nearer the centre it is "equal only to the speed of the vessel."

[Printed, 2½*d*. No drawings.]

A.D. 1852, October 5.—N° 225.

APSEY, Joseph.—1. Constructing a vessel's floor, inclined upwards near the bows, so that it shall rise partly out of water when at full speed.

2. Screw propeller. There are two half turns of a double-threaded screw, and the boss diminishes from the fore end to nothing at the after end. There is no stern bearing.

3. A screw-propeller shaft is driven by gearing it internally to a large driving wheel turned by three steam-engine cylinders equidistant around it.

[Printed, 10½*d*. Drawings.]

A.D. 1852, October 8.—N° 300.

CRESTADORO, Andrew.—An endless flexible flooring, supported on revolving shafts, is caused to turn them by a horse walking upon the floor and harnessed to a frame fixed to the shaft. The power is transmitted through two cones with their bases towards different sides. The cones serve as drums for belts.

When used to propel vessels the shafts are furnished with paddle-wheels devoid of floats but of drum-like form and submerged, with part of their surfaces covered by a shield.

[Printed, 9½*d*. Drawings.]

A.D. 1852, October 9.—N° 328.

HINE, William.—(The Patent is void from want of notice to proceed.)

Feathering paddles. Each float turns on a horizontal axis and is feathered by an excentric wheel moving a crank arm on the float. For the excentric wheel may be substituted a rim guided by rollers.

[Printed 5½*d*. Drawings.]

A.D. 1852, October 12.—N° 345.

PERKES, Samuel.—(The Patent is void from want of notice to proceed.)

1. Construction and form of vessels. Sails. Windmill sails to drive propelling wheels. Sheathing.

2. Paddle-wheels. The floats are set so that the outer edge of *the lowest float* is further astern than the other edge.

3. Converting the smoke of steam-vessels into gas to light the vessel.

[Printed, 3½*d*. No drawings.]

A.D. 1852, October 15.—N° 398.

TURCK, HERMANN.—Certain arrangements for combining the use of paddle-wheels and screw propellers in the same vessel. The paddle-shaft has a bevil wheel, into which may be geared a bevil wheel on a shaft turning the screw-propeller.

The paddle-shaft may be disconnected from the intermediate or engine-shaft, so as to allow the paddle-engine to turn the screw only. By disconnecting a sliding coupling-joint in the propeller-shaft it may be thrown off the propeller engine while the paddle-wheels are turned by it.

[Printed, 10½*d*. Drawings.]

A.D. 1852, October 21.—N° 479.

ADDISON, WILLIAM.—(The Patent is void from want of notice to proceed.)

Certain propellers, partly cylindrical in shape, oscillate in connexion with recesses, so as to act as constant oars in a manner not described.

[Printed, 2½*d*. No drawings.]

A.D. 1852, October 27.—N° 538.

HERVIER, ALFRED CHARLES.—Water received at the central opening in one side of a wheel revolving (nearly horizontally) at the bottom of a vessel is forced out sternwards centrifugally.

The wheel has a crown or side plate at the upper part, and by ribs on this the water between it and the casing may be so expelled as to cause a partial vacuum, and thus draw the wheel towards it by which means the strain is partly taken from the lower bearing of the shaft.

[Printed, 1*s*. 1½*d*. Drawings.]

A.D. 1852, November 8.—N° 673.

BRODIE, JAMES.—(The Patent is void from want of notice to proceed.)

Screw propeller. The screw is enclosed on one or two sides, and may be fixed at the vessel's bow, and the water put in motion is to be carried under or through the vessel.

[Printed, 2½*d*. No drawings.]

A.D. 1852, November 17.—Nº 776.

BRESSON, Francis.—1. Land carriages.

2. Water, or a denser fluid, or air forcibly discharged by a reciprocating or rotary pump, propels a vessel. The discharge should take place not far beneath the water, and its velocity should be double that of the boat.

[Printed, 9½*d*. Drawings.]

A.D. 1852, December 1.—Nº 929.

GREEN, Frederick William.—(The Patent is void from want of notice to proceed.) Two pistons act directly on the water in horizontal tubes under water at the bottom of a vessel. The inner parts of the pistons are open to the atmosphere. Other tubes opening to the bows are used for backing the vessel.

[Printed, 2½*d*. No drawings.]

A.D. 1852, December 2.—Nº 932.

TAYLOR, William.—A vessel is propelled by a long wedge-shaped beam caused to oscillate in the water round a "hypomoclion," the effect of which is described at length, but is not intelligible.

[Printed, 8½*d*. Drawings.]

A.D. 1852, December 6.—Nº 980.

CONOLLY, Thomas, and COTTER, William.—A framework is moved fore and aft horizontally under water at each side of a vessel, and carries a broad vane which is so hinged as to fold flat for the return stroke, and to project at right angles with the frame during its effective stroke.

[Printed, 8½*d*. Drawings.]

A.D. 1852, December 8.—Nº 998.

BEATSON, Donald, and HILL, Thomas.—Screw-propellers. A flange is placed on each blade so as to diminish the "slip" by retaining the water. The flange is part of a cylinder, the axis of which is coincident with that of the shaft. The edge of the flange may project to different distances from the blade.

[Printed, 2½*d*. No drawings.]

A.D. 1852, December 8.—N° 999.

HILL, THOMAS.—(The Patent is void from want of notice to proceed.) Paddle-floats with a flange or raised side added to their ends to prevent the slip.

[Printed, 2½*d*. No drawings.]

A.D. 1852, December 8.—N° 1002.

WILSON, JAMES SPOTSWOOD.—A "wing propeller," formed of blades not parts of a screw, turning on a shaft inclined at an angle of 45° to the water at each side of a vessel.

The shaft has a screw along its length taking into another on the propeller, and when the shaft is at rest the propeller ascends, it (on the screw) being turned by the water. The propeller may be disconnected by a long key reaching the whole length of the shaft.

[Printed, 6½*d*. Drawings.]

A.D. 1852, December 9.—N° 1010.

HUNT, EDMUND.—(The Patent did not proceed to the Great Seal.) Screw propeller. The blades are elastic, and may consist of rods connected by pieces and covered with gutta percha, so that the action of the water upon them as they revolve will cause them to expand into the proper form, while their normal condition when at rest is that of a flat blade in a plane fore and aft.

[Printed, 2½*d*. No drawings.]

A.D. 1852, December 13.—N° 1040.

MACKAY, GEORGE.—(The patent is void from want of notice to proceed).

Feathering paddles. Each float turns on a horizontal axis by the action of a rod from an excentric wheel. The position of the excentric may be altered by a cogged sector, so the floats will be horizontal when the wheel is at rest.

[Printed, 2½*d*. No drawings.]

A.D. 1852, December 16.—N° 1082.

SLATE, ARCHIBALD.—Alongside a canal a rail is fixed, and a tow-boat carries a frame by which wheels biting the rail are caused to work themselves along it, and thus to tow boats attached to the frame.

[Printed, 5½*d*. Drawings.]

A.D. 1852, December 16.—Nº 1084.

SLATE, Archibald.—Screw propeller. One of these is placed at each side of a vessel affixed to jointed knife-edged iron frames under the shrouds, so as to be shipped. Opposite each screw is a chamber in the vessel open to the deck above, and containing the driving-wheel, which projects through an aperture in the side of the vessel, so as to take into a wheel on the screw-shaft, which is kept in contact with the driving-wheel by tightening chains from the shaft bearings to the deck.

[Printed, 1*s.* 1½*d.* Drawings.]

A.D. 1852, December 17.—No. 1095.

KINGSTON, John Filmore.—1. Apparatus for reciprocating motion.

2. A "propeller blade" is caused to oscillate horizontally upon a vertical spindle at a ship's stern, and the blade may be transferred from one side to the other of this spindle, so as to propel the vessel in the other direction, by the operation of a chain turning the blade on its axis at the point of connection with the blade or by causing it to slide on grooves.

[Printed, 6½*d.* Drawings.]

A.D. 1852, December 21.—Nº 1121.

BEADON, George.—Screw propeller. The lower part of a vessel's bow is shaped so as to allow a conical screw to revolve as a propeller projecting forwards.

The stern propeller has a universal joint upon the shaft inside the vessel, with a curved horizontal stuffing box, so that the screw can be turned to one side or another for steering. A boat similarly propelled is to be carried below deck, and may be launched through a stern-port. The drawing represents screw blades moveable on their radial axes by spindles and cog-wheels within the shaft.

[Printed, 1*s.* 0½*d.* Drawings.]

A.D. 1852, December 24.—Nº 1163.

NEWTON, Alfred Vincent.—" In applying this invention to " carriages, either on railways or common roads, the weight of the " carriage itself is made to act on the periphery of the running " *wheels,* and thereby assist in imparting motion thereto."

"The same principle is applicable to all purposes where an "impelling power is required, whether for propelling on land or "water."

[Printed, 10½*d.* Drawings.]

A.D. 1853, January 5.—N° 28.

PENRICE, Herbert Newton.—Two bars, carrying broad vane propellers, are caused to work at a vessel's stern so as alternately to push against the water and lift their ends for the return stroke. This is effected by mounting their inner ends on the cranks of a shaft across the vessel, while the bars slide through a tubular bearing.

[Printed, 6½*d.* Drawings.]

A.D. 1853, January 6.—N° 33.

BROWNE, John.—(The Patent is void from want of notice to proceed.) 1. Sliding keels.

2. A "box in box propeller," not explained.

3. An endless chain of floats travelling over rollers.

[Printed, 2½*d.* No drawings.]

A.D. 1853, January 7.—N° 52.

GWYNNE, James Egleson Anderson.—(The Patent is void from want of notice to proceed.) Air-tight drums are to be used instead of paddle-wheels.

[Printed, 2½*d.* No drawings.]

A.D. 1853, January 19.—N° 134.

JUDGE, Thomas.—(The Patent is void from want of notice to proceed.) A vertical blade is mounted on a shaft which is turned partly round and back again, but the action of the blade as a propeller is not explained.

[Printed, 2½*d.* No drawings.]

A.D. 1853, January 21.—N° 152.

THORNTON, George.—Pistons act directly against the water through horizontal cylinders under water at a vessel's stern, and at the other side of each piston a vacuum is maintained.

[Printed, 5½*d.* Drawings.]

A.D. 1853, January 24.—N° 175.

BEATSON, Donald.—Screw propellers. The blades are corrugated, ribbed, fluted, or ridged in lines marked by the end of a radius having its centre in the shaft axis.

[Printed, 4½*d*. Drawings.]

A.D. 1853, January 24.—N° 177.

RANDOLPH, Charles, and ELDER, John.—A mode of working the screw-propeller by an engine with two cylinders—one of which (the larger) receives the steam from the other, and allows it to work expansively. The two sets of cylinders require different amounts of lead and lap in the valve, which are provided for, and the needful adjustments may be effected by a plan of hand-gearing described.

[Printed, 1*s*. 3½*d*. Drawings.]

A.D. 1853, January 27.—N° 204.

STURDEE, Alfred Barnes.—(The Patent is void from want of notice to proceed.) A screw propeller or paddle-wheel turns in a channel in a vessel with two keels and bodies continued nearly to midships, where the channel merges into the ship's form.

[Printed, 2½*d*. No drawings.]

A.D. 1853, January 28.—N° 219.

RUSSELL, John Scott.—Screw propeller. The rudder works in an aperture in the deadwood below and forward of the propeller-shaft, which passes through an opening in the upright shaft of the rudder. The forward bearing for the propeller-shaft is at a considerable distance forward, and there is a joint or hinge in the shaft so that the after part of it with the propeller may be turned upwards, a passage being left for it in the deadwood, made double for this purpose.

[Printed, 5½*d*. Drawings.]

A.D. 1853, January 31.—N° 245.

CAULFIELD, Charles.—(The Patent is void from want of notice to proceed.) Pistons moved in (or beyond) hollow tubes under water in a vessel are caused to act directly upon the water.

[Printed, 2½*d*. No drawings.]

A.D. 1853, February 3.—N° 290.

SPILLER, THOMAS, and CROWHURST, ANTHONY.—A propeller consisting of a rod which moves up and down vertically near a vessel's stern, carrying at the end a cross piece with vanes which are so hinged as to incline at an angle (regulated by stops), and act somewhat in the manner of a fish's tail.

[Printed, 8½*d*. Drawings.]

A.D. 1853, February 4.—N° 309.

DUDGEON, JOHN.—Screw-propeller. The rudder is divided and the parts so attached as to allow the propeller-shaft to work between them, and carry the propeller outside a bearing post astern of the rudder. The propeller has the part which works in these stern bearings hollow so that the shaft may be pushed in to it, and be in gear, or it may be moved forward to be disconnected, after which the propeller is to be raised along the after sternpost.

[Printed, 6½*d*. Drawings.]

A.D. 1853, February 5.—N° 329.

COWAN, JOSEPH.—(The Patent is void from want of notice to proceed.) A framework moved out and in horizontally at a vessel's stern carries a flap on hinges which by means of adjustable stops will act directly on the water and fold up for the return stroke.

[Printed, 4½*d*. Drawings.]

A.D. 1853, February 8.—N° 337.

BUCHANAN, JOHN.—Screw propeller. The outer bearing is supported by a vertical piece bent down from a horizontal one above the propeller. The horizontal arm is so fixed to an upright shaft supported by pintles, that the whole may be turned like a rudder, and thus the propeller will steer without any additional rudder. Each of the blades is to be turned round upon its radial axis by an instrument admitted from above (in a manner not explained). When two sets of blades are used, one of them may be loose on the shaft, so as to turn into position by the action of the water, or stand upright (as well as the other set) when the vessel is at rest.

[Printed, 5½*d*. Drawings.]

A.D. 1853, February 9.—N° 346.

SEAWARD, John.—Placing the condenser of marine engines in close proximity with the cylinder, and providing a pipe to communicate with the foot valve of the air pump.

The construction is stated to be particularly adapted to screw-propeller engines.

[Printed, 6½*d.* Drawings.]

A.D. 1853, February 17.—N° 411.

BROWNE, John Collis.—(The Patent is void from want of notice to proceed.) Rods swinging at a vessel's side carry duck-feet or collapsing vanes acting in the water.

[Printed, 4½*d.* Drawings.]

A.D. 1853, February 18.—N° 424.

MADDEN, Peter.—(The Patent is void from want of notice to proceed). Pistons act directly on the water in horizontal cylinders under water at a vessel's stern. There are two rudders and a gateway to be let down in conjunction with them. Hinged vertical boards are used in the forward part of the vessel to keep her stiff, and yet allow her easily to go about.

[Printed, 2½*d.* No drawings.]

A.D. 1853, February 19.—N° 436.

TOURNIERE, Pierre Auguste.—A framework is caused to work to and fro, or to swing horizontally on an axis at a vessel's stern, and to carry vanes which act directly on the water and feather for the return stroke by the action of stops behind each vane worked simultaneously by a long bar.

[Printed, 9½*d.* Drawings.]

A.D. 1853, February 26.—N° 492.

GRIFFITHS, Robert.—Screw propellers. The boss is spherical and hollow, and contains apparatus for setting the angles of the blades.

Each blade (which is of a tapering form with the leading side more cut away than the trailing side) has its shank inserted in the lower part of the socket of the boss, so that it may turn round, but is kept from falling out by lugs. The interior part of the blade carries a pinion acted on by a bevil segment turned through the desired angle by a screw with a square head, which may be reached by a key from the vessel.

In other forms the blades are turned by screw and rackwork.

It is also proposed to divide the boss into two parts. The blades may be adjusted in one, and the other part being bolted on the blades will be fixed.

(Reference is made to a Patent in A.D. 1849, N° 12,769; see *ante*, p. 219.)

[Printed, 1*s.* 1½*d.* Drawings.]

A.D. 1853, March 1.—N° 509.

DANIELL, Joseph Clisild.—(The Patent is void from want of notice to proceed.) A number of pistons moving in cylinders, open at one end, act against the air, or, under water, against the water, so as to propel a vessel.

[Printed, 4½*d.* Drawings.]

A.D. 1853, March 1.—N° 512.

ROWETT, William.—Paddle-floats. These are made of a cylindrical form, solid or hollow, or "shaped to any polygon form "of any shape that may be described, either within a circle or an "ellipse."

[Printed, 5½*d.* Drawings.]

A.D. 1853, March 3.—N° 528.

CLARK, William.—(The invention did not proceed to the Great Seal.)

Screw propellers. Each blade has the pitch of its central portion such that it possesses no propelling effect when the vessel is going at its maximum speed.

[Printed, 2½*d.* No drawings.]

A.D. 1853, March 5.—No. 559.

MAUDSLAY, Joseph.—(The Patent is void from want of notice to proceed.)

"Feathering the blades of screw propellers, by means of worm-"wheels fixed on the lower end of the blades, and worked by "screws, which are placed in recesses in the boss."

[*Printed, 2½d. No drawings.*]

A.D. 1853, March 15.—N° 646.

MAUDSLAY, Joseph.—Screw propeller. Each blade is turned on its radial axis by a lever on the side, worked by a link taking into a grooved sliding collar, which moves along the shaft by a rack, into which gears a cogged wheel turned by an endless screw, or a spindle worked on deck by a key or a tiller.

By this means the blades may be set to any angle without stopping the shaft. The propeller and apparatus may be raised on deck through a well.

(Reference is made to a Patent granted in 1848, N° 12,088; see *ante*, p. 210.)

[Printed, 6½*d*. Drawings.]

A.D. 1853, March 16.—N° 650.

HEILAKKER, John Vander.—Two cranked horizontal shafts across a vessel carry framework with paddles upon it, so that as the shafts revolve the paddles act on the water, and are always vertical.

[Printed, 6½*d*. Drawings.]

A.D. 1853, March 24.—N° 719.

HOLM, Charles Augustus.—Screw propeller. Each blade has a curved flange added to it, so that the convex surface is turned in the direction of the vessel's motion, and the concave blade prevents the water from being thrown outwards by centrifugal action. The curved flange runs round the entering side of the blade and the rim, and particular directions are given for constructing the various curves at different parts. Another curved flange may be added on the other side of the blade, so as to act in backing the vessel.

[Printed, 7½*d*. Drawings.]

A.D. 1853, March 28.—N° 734.

CAMPBELL, John George Truscott.—Screw propeller. The blades are to be of a curvelinear form, for drawing which very detailed and complicated directions are given.

[Printed, 5½*d*. Drawings.]

A.D. 1853, March 28.—No. 738.

***SCOTT*, John, and JAFFREY, George William.**—*Steam-engines for* screw propellers. The cylinders are inverted and inclined below the shaft. Each has two piston-rods, carrying a crosshead with connecting rods which work a first-motion shaft by crank pins on the sides of large cog-wheels carried by the shaft and gearing into others on the screw-propeller shaft. The air-pumps are both at one side of the engine, and the upper closed ends of the cylinders are bound together by arched pieces carrying the valve gear. Other minor details are described and illustrated in the drawings.

[Printed, 1*s*. 3½*d*. Drawings.]

A.D. 1853, March 29.—Nº 754.

PYM, John.—(Provisional Protection refused). Screw propeller. Two screws turning in opposite directions, one on a shaft passing through the other shaft, which is hollow.

[Printed, 2½*d*. No drawings.]

A.D. 1853, April 12.—Nº 874.

HARMAN, Henry William.—Steam-engines for driving the screw propeller direct.

The cylinders and condensers are opposite and athwart ship. Each piston has four piston-rods, which work in the condensers and carry a crosshead beyond, which thus works a connecting-rod through a trunk in the condenser, so as to turn the propeller shaft which is midway between the cylinders and the condensers.

The air-pumps, bilge pumps, and hot water pumps are all cast in the condensers, and worked from the crossheads of the piston.

[Printed, 6½*d*. Drawings.]

A.D. 1853, April 19.—Nº 949.

BLAIR, Andrew.—An endless chain turning over two wheels at a vessels' side, carries floats which project so as to act upon the water and fold up as they leave it, and lie flat during their return through the air.

For this purpose each float turns on a horizontal axis, beyond which, on the inner side, there projects a tail-piece and the wheel presses against this so as to regulate the position of the float.

[Printed, 6½*d*. Drawings.]

A.D. 1853, April 22.—Nº 970.

SAGER, William.—A float at the end of a rod sliding up and down in a socket at a vessel's side is so moved by a crank on a horizontal axis as to cause the float to act like a paddle-float partly feathered. Several of these being connected by a horizontal bar, work alternately with another set of similar construction.

[Printed, 6½*d*. Drawings.]

A.D. 1853, May 3.—1082.

LIPSCOMBE, Frederick.—(The invention did not proceed to the Great Seal.) Water received through a tube is discharged through another smaller tube, which may be turned so as to propel and steer at once.

[Printed, 2½*d*. No drawings.]

A.D. 1853, May 4.—N° 1094.

RUSSELL, John Scott.—1. Three oscillating cylinders are disposed round the shaft, so that the piston-rod of one is connected as usual to the crank-pin. Each of the other piston-rods is connected by a joint to the piece on the end of the first, so that all three work the same crank-pin.

2. A tube leading from an oil reservoir is jointed like a telescope to allow it to carry the supply to a part of the engine in motion.

3. Disconnecting shafts. By hand pressure a wheel on the engine-shaft may be started so as by the motion of the shaft to turn a screw and pinion which tightens or relaxes a friction band by which a disk on the engine-shaft is caused to turn the propeller-shaft.

[Printed, 10½*d*. Drawings.]

A.D. 1853, May 5.—N° 1103.

RAWE, John.—Several hollow drums, like paddle-wheels, support a floating framework or a vessel on each side, and being furnished with projections to act like floats their rotation propels her.

[Printed, 8½*d*. Drawings.]

A.D, 1853, May 5.—N° 1109.

PRIDEAUX, Thomas Symes.—Screw propeller. Each blade has the outer part so connected to the rest by steel springs, that it may bend in one direction while it cannot do this in the other, because of certain stops.

The horizontal thrust of the propeller shaft is received in a cylinder to which the end of the shaft fits tightly as a piston. The space between the end of the piston and the cylinder contains a fluid or semifluid substance, and a tube from this indicates the presence by a dynamometer. The propeller shaft is worked by cylinders whose piston rods are attached to rings traversing the cylinders outside in guides, and carrying connecting rods to turn the shaft directly.

[Printed, 5½*d.* Drawings.]

A.D. 1853, May 9.—N° 1135.

FISHER, John.—Screw propeller. Each blade has various openings through it, and flanges or ridges may be added on the back. The surface may be enamelled.

[Printed, 11½*d.* Drawings.]

A.D. 1853, May 11.—N°. 1166.

BELLEVILLE, Julien Francois.—(The Patent is void from want of notice to proceed.) A piston acts directly against fluid in a cylinder open at one end, and with a stuffing box at the other.

[Printed, 2½*d.* No drawings.]

A.D. 1853, May 12.—N° 1172.

GOBLE, George Frederic.—Floats are carried on an endless chain passing over three drums. The bearings of one of these may be moved by a jointed rod so as to adjust the direction in which the chain and floats shall act in the water.

[Printed, 7½*d.* Drawings.]

A.D. 1853, May 18.—N° 1221.

PALMER, Christopher Richard Norris.—(The Patent is void from want of notice to proceed.)

Power obtained by a steam-engine is transferred through a tube containing water, to a piston and cylinder at a distance. The Patentee considers he can thus increase the power obtained.

[Printed, 2½*d.* No drawings.]

A.D. 1853, May 21.—N° 1262.

BELLFORD, Auguste Edouard Loradoux.—A vessel consists of a hollow drum with floats projecting from the outside.

Machinery inside causes the drum to revolve and therefore to progress. A small boat or similar body drawn astern is made to act as a rudder by moving to each side the rope which attaches it to framework resting horizontal outside the vessel, and in which the axles of the drum turn. The passengers, crew, and cargo are carried inside. In other plans the vessel consists of a frame supported on two or more drums caused to revolve and thus to be propelled.

[Printed, 8½*d.* Drawings.]

A.D. 1853, May 25.—N° 1281.

BAUER, William.—(The Invention did not proceed to the Great Seal.) A submarine vessel. The screw-propeller of this "hyponaut" is driven by an engine worked by the gas produced from a chemical mixture. It is steered laterally by a rudder, and vertically by moveable fins. It is trimmed by an adjustable weight and by receiving more or less water. Air is supplied from above, being drawn through a tube by an engine. The arms of the crew may be thrust through watertight sleeves so as to work with materials outside.

[Printed, 2½*d.* No drawings.]

A.D. 1853, May 30.—N° 1333.

APPOLD, John George.—(The Patent is void from want of notice to proceed.)

Screw propeller. Each blade is of the same breadth throughout but tapers in thickness and is so bent that "a section taken at any "part of the blades in a line parallel with their sides will present" a figure of S, as shown in the drawing.

[Printed, 2½*d.* Drawings.]

A.D. 1853, June 1.—N° 1341.

HARDWICK, Alfred.—Water is discharged at considerable velocity through tubes below water so as to propel a vessel. Valves turning on hinges are used to direct the flow of water through one or another opening to back or steer the vessel.

[Printed, 7½*d.* Drawings.]

A.D. 1853, June 1.—Nº 1345.

SCOTT, MAXWELL.—Screw propeller. Each blade consists of a broad edged piece supported at a distance from the shaft by an arm. Thus two blades, with their arms in one diameter, present the appearance of the letter Z.

The flat part of each blade may be turned to any needful angles of pitch upon the arm which is fixed to the boss and be there secured by tightening various screws. The blade being moveable on the arm may be set to any angle by a short crank at its lower part. This is worked by a grooved wheel that turns on the shaft, and is moved out or in by rods reaching inside the vessel through stuffing boxes.

[Printed, 7½*d*. Drawings.]

A.D. 1853, June 9.—Nº 1407.

GARROOD, GEORGE WILLIAM.—(The Patent is void from want of notice to proceed.) Float-boards on an endless chain turning on wheels, one of which is larger than the other.

[Printed, 4½*d*. Drawings.]

A.D. 1853, June 9.—Nº 1409.

ARNOUX, CLAUDE.—Grooved pullies, turned by a steam-engine, draw a vessel along by acting on a rope or chain fastened at the ends, and laid down through the whole distance to be traversed.

[Printed, 2½*d*. No drawings.]

A.D. 1853, June 14.—Nº 1439.

PENNY, JOSEPH H., and ROGERS, THOMAS B.—A framework of horizontal rods carries a set of vertical floats at a vessel's side, and is supported at the ends on cranks or excentrics upon two shafts across the vessel.

By this means the floats dip into the water vertically and return through the air. The excentric to be used may consist of several ante-friction wheels, instead of the single solid wheel within the rim of the ordinary excentric.

The floats may be constructed so as to yield partly in one direction against springs when violently struck by the waves.

[Printed, 11½*d*. Drawings.]

A.D. 1853, June 30.—Nº 1574.

HANDCOCK, Elias Robison.—Various directions are given for determining the forms of the teeth of cog-wheels to be used in gearing, especially for the screw-propeller shaft.

In one plan there are two independent wheels on each shaft, and one pair gear only when the engine is turned ahead, while the other pair may gear for turning astern.

Slips of gun-metal or steel are to be slipped into grooves to protect those parts of teeth that are most worn.

[Printed, 8½*d*. Drawings.]

A.D. 1853, July 15.—Nº 1685.

LIDDELL, CHARLES.—Boats are towed on canals by endless ropes at the sides. The ropes pass round corners and curves on sheaved-wheels, combined with flanged guides, so arranged as to allow the rope from the boat to the main endless-rope to pass the guide-pulley readily.

(The Patent is referred to in the Specification of a Patent in A.D. 1854, Nº 1035, see *post*, p. 262.)

[Printed, 10½*d*. Drawings.]

A.D. 1853, July 29.—Nº 1775.

M'CONNELL, James Edward.—Boilers for marine engines have cross-partitions to prevent the rolling of the ship from sending all the water to one side. Other improvements are described in the boilers, furnaces, and engines.

The screw-propeller shaft is made hollow or tubular.

[Printed, 10½*d*. Drawings.]

A.D. 1853, July 29.—Nº 1776.

MACKAY, James.—Screw propeller. Each blade is a semicircular disc, set excentrically on the shaft. The shaft works in the stern-post, and the deadwood near it is so shaped in a cylindrical enlargement as to cause the water to run along without closing in, so as again to be disturbed by the boss.

[Printed, 5½*d*. Drawings.]

A.D. 1853, July 30—Nº 1784.

***BELLFORD,* Auguste Edouard Loradoux.**—(Provisional *protection* was refused in this case by the Law Officer, but a

Patent for the invention was granted December 19, 1853, No. 2949.) Paddle-wheels. The floats are formed by lines ranged spirally in opposite directions at angles of about 75° to the axis, so that they present the appearance of cells or buckets, with their sharper angles entering the water.

The inner openings of the buckets are contracted endwise, as shown in the drawings.

[Printed, 5½*d.* Drawings.]

A.D. 1853, August 1.—N° 1786.

BUCHANAN, John.—(The Patent is void from want of notice to proceed.)

Screw propeller. This may be lowered with the rudder (in a manner not explained), and if not secured from entanglement with floating bodies there is an instrument (not described) for removing such bodies. The thickest part of each blade is not in the middle, but at the following or trail side of the blade.

[Printed, 2½*d.* No drawings.]

A.D. 1853, August 2.—N° 1803.

ANDERSON, William Lanphir.—A paddle on a shaft with a ball or socket operates like an oar without feathering. The apparatus is not particularly described.

(The invention appears to be that patented by the same Patentee September 19, 1853, N° 2172; see *post*, p. 255.)

[Printed, 2½*d.* No drawings.]

A.D. 1853, August 4.—N° 1820.

HICKSON, William.—1. Canal boats are moved in a lock from one level to another by floating into larger boats sunk in the lock and then raised by withdrawing the water from inside. A modification of this plan raises the canal boats so that they may discharge their cargoes through openings in the bottom.

2. Screw propeller. Two screws revolve in opposite directions on the same centre. They are at times only half immersed and may be used for steering by relaxing the speed of one or other of them. When a boat thus provided is carried in a barge the engine in the boat is coupled with the propeller-shaft of the barge so as to propel the whole.

[Printed, 7½*d.* Drawings.]

A.D. 1853, August 10.—N° 1865.

MUSHET, David, and WHELE, Edwin.—A horizontal bar at a vessel's side carries a number of vertical floats, and the bar is moved by a crank so as to take the floats back through the air.

When used as a submerged propeller the bar moves through sockets, fore and aft, and the floats are hinged so as to fold during the return stroke. In another plan the floats are on rods hinged to the bar, and each rod passes through a socket below the bar.

[Printed, 7½*d.* Drawings.]

A.D. 1853, August 10.—N° 1862.

MACSWENY, Thomas.—A vessel formed of sections, jointed to move vertically, propelled by a propeller in the aftmost section.

[Printed, 5½*d.* Drawings. A vessel was launched June 12, 1858.]

A.D. 1853, August 16.—N° 1913.

RANKIN, Benjamin.—(The invention did not proceed to the Great Seal.) Screw propeller. Instead of a blade half of a float or disk is placed at an angle across one side of the propeller-shaft.

[Printed, 2½*d.* No drawings.]

A.D. 1853, August 31.—N° 2025.

BROOMAN, Richard Archibald.—Feathering paddles. Each float turns on a horizontal axis and is divided in the centre to admit a ring to hang on small cranks attached to the floats so that the weight of the ring keeps the floats vertical.

[Printed, 5½*d.* Drawings.]

A.D. 1853, September 10.—N° 2091.

JONES, Stopford Thomas.—(The Patent is void from want of notice to proceed.)

Paddle-wheels. The floats are in sections resembling a number of steps about eight inches apart. Each section (being shorter than a float of the usual form which reaches across the wheel) overlaps the other about four inches, and they are connected in pairs by bolts when in four sections. The wheels may be worked in the centre of the boat.

[Printed, 2½*d.* No drawings.]

A.D. 1853, September 16.—N° 2151.

HIGGINSON, Francis.—Pistons with or without valves act directly on the water in tubes open below a vessel, and stopcocks are used to shut off certain tubes for reversing the motion.

[Printed, 6½*d.* Drawings.]

A.D. 1853, September 19.—Nº 2172.

ANDERSON, William Lanphier.—A paddle like a broad vaned oar is supported by a ball and socket joint, and the inner end of the loom is turned by a vertical wheel. A rod suspended vertically from a bearing above the oar sways fore and aft like a pendulum, and passes through a slot on the loom of the oar which slides upon it during a revolution. By this means the oar feathers.

The bearing of the rod may be adjusted so as to regulate the angle of feathering, and the crank on the wheel carrying the inner end of the loom of the oar may be adjusted in length to regulate the amount of stroke both in depth and in range fore and aft.

(See Patent in A.D. 1853, Nº 1803, *ante*, p. 253.)

[Printed, 8½*d*. Drawings.]

A.D. 1853, September 22.—Nº 2195.

WHITE, George.—(The invention did not proceed to the Great Seal.) Feathering paddles. Each float turns on a horizontal axis, and is feathered by indented rods from cams or excentrics, taking into a cogged sector on the float.

[Printed, 2½*d*. No drawings.]

A.D. 1853, October 1.—Nº 2247.

LETESTU, Jean Marie. (The Patent is void from want ot notice to proceed.)

Pistons acting in tubes discharge water through them under a vessel's bottom both at the forward and backward stroke of the pistons.

[Printed, 2½*d*. No drawings.]

A.D. 1853, October 3.—Nº 2258.

WILDING, William Henry.—Feathering paddles. The blades of a submerged propeller feather on their radial axis by an apparatus similar to the elliptic chuck (used in a lathe), or by arms from each blade turning in a curved cam groove as the shaft revolves. The propeller (on an inclined shaft) may be detached by means of a trunk, and hoisted on deck.

(Reference is made to a Patent granted in A.D. 1849, Nº 12,690; see *ante*, p. 218.)

[Printed, 5½*d*. Drawings.]

A.D. 1853, October 11.—N° 2334.

MUNTZ, William Henry.—Paddle-wheels. There is a central rim to each wheel, which is larger than any of the side rims. The floats are of a curved form, represented in the drawings, and so acting on the water as to present a wedge-shaped point in entrance and exit.

[Printed, 8½*d*. Drawings.]

A.D. 1853, November 17.—N° 2671.

GRIFFITHS, Robert.—Screw propellers. Each blade is inserted into the boss, and on being partly turned round is retained in the boss by projecting lugs upon its shanks, and by bolts inserted. The rudder has a conical hole fore and aft in it, to allow the propeller to work behind the rudder but close up to it, a part of the rudder being cut away. The propeller may work forward of part of the rudder in a recess cut out of the rudder. To unship the propeller (when astern of the rudder), the shaft carrying it being detached is pushed out sternwards, and a chain from outside hoists it and the propeller on deck. It is returned to its place by a chain through tubing and the shaft bearing to the shaft, which is thereby drawn into its place and brings the propeller with it. The blades are curved in a manner shown in the drawings.

[Printed, 6½*d*. Drawings.]

A.D. 1853, November 21.—N° 2706.

JOYCE, William, and MEACHAM, Thomas.—Marine engines. The piston has double rods, with a cross-head carrying the connecting rod on a piece projecting backwards into a cup-like indentation in the cylinder cover. The piston and the bottom of the cylinder have corresponding cup-like hollows. Neither spindles nor guides need be used for the valves of the air-pump. The engine is placed across the keel, and the air-pump is at the other side to counterpoise the cylinder.

[Printed, 1*s*. 3*d*. Drawings.]

A.D. 1853, December 5.—N° 2822.

SIMONS, William.—(The Patent is void from want of notice to proceed.) Screw propeller. The propeller works in a recess cut *in the rudder*. The spindle of the rudder may have an elliptical eye to pass the propeller shaft, or it may be set a little on one side, and the rest of the rudder placed due fore and aft parallel with the stern-post.

[Printed, 2½*d*. No drawings.]

A.D. 1853, December 19.—Nº 2949.

BELLFORD, Auguste Edouard Loradoux.—(This invention is the same as that described under the date July 30, A.D. 1853, Nº 1784; see *ante*, p. 252. The Patent was granted on December 19, though it had been refused before to the same applicant.)

[Printed, 5½*d*. Drawings.]

A.D. 1853, December 19.—Nº 2953.

GOLDTHORP, David.—(The Patent is void from want of notice to proceed.) A propeller like an oar has a vibratory "sculling" motion imparted by cranks and levers, in conjunction with a moving nut and double-threaded screw, the particular action of which is not described.

[Printed, 2½*d*. No drawings.]

A.D. 1853, December 21.—Nº 2971.

JONES, John.—Screw propellers. One pair of blades are loose on the shaft, so as to be placed vertical and parallel with the other pair when at rest, while they are turned to their proper position by the action of the water when in motion. A clutch moved along the shaft is caused to secure the blades by keys.

A set of shorter intermediate blades may be applied, and a ring attached to them to confine the water near the boss.

The propeller shaft may be made hollow and of large diameter at the boss, and at the bearing end in the sternpost, to allow anti-friction wheels to be applied.

[Printed, 11½*d*. Drawings.]

A.D. 1853, December 24.—Nº 2989.

GOUTARET, George.—(This Invention did not proceed to the Great Seal.) Springs and clockwork move two sets of shafts across the vessel with cranks carrying horizontal bars furnished with paddles, which act upon the water as the cranks revolve, and always retain a vertical position.

[Printed, 5½*d*. Drawings.]

A.D. 1853, December 31.—N° 3042.

HUNT, Benjamin.—(The Patent is void from want of notice to proceed.)

Fluid issuing from a hole in a vertical tube propels a vessel. The pressure is kept up by pumping the fluid up again, and for part of this operation the action of the fluid itself is employed.

[Printed, 2½*d*. No drawings.]

A.D. 1854, January 9.—N° 50.

HOWSON, Richard.—(The Patent is void from want of notice to proceed.) Screw-propellers. Each blade is curved in a manner explained by drawings, so as to act partly like the wing and breast of a bird. Instead of the usual blades, the screw may consist of several sections (like double narrow framework blades), of which one is fixed to the boss, and the others are so moved round by the operation of the water as to expand an elastic or flexible fabric wrapped upon them. The blade is thus feathered and opened out in the manner of a fan.

[Printed, 6*d*. Drawings.]

A.D. 1854, January 10.—N° 58.

MITCHELL, Alexander.—Screw propellers. A particular form of curved blade is described and illustrated by drawings.

The propeller-shaft has a screw in it taking into a screw cut in the boss of the propeller, so that the strap being unscrewed and withdrawn allows the propeller to be hoisted by ropes slung to a hook on one of the arms. Slide bolts prevent the shaft from becoming detached when it is turned astern.

The withdrawal of the shaft is effected by disconnecting two parts of it which slide one within the other, and a stationary clutch is lowered, which brings a screw into gear with a thread on the shaft, and thus moves the shaft lengthways as it revolves.

[Printed, 1*s*. 7*d*. Drawings.]

A.D. 1854, February 1.—N° 249.

BUCHANAN, John.—(The Invention did not proceed to the Great Seal.) Screw propellers. "The propelling surfaces are "placed in or on the shaft in advance of each other in line after "the manner of a Venetian blind, and not in radial lines, as hereto-

" fore, and the breadth of each surface need not exceed the thick-
" ness of the mainpost of the vessel."

A frame (not described) is used to protect the propeller.

[Printed, 3*d*. No drawings.]

A.D. 1854, February 3.—N° 272.

LANNES, Alfred.—(The Patent is void from want of notice to proceed.) One or more cylindrical sectors vibrate on an axis nearly vertical, so as to act like oars in a manner not particularly described.

[Printed, 3*d*. No drawings.]

A.D. 1854, February 14.—N° 356.

HOLM, Charles Augustus.—Water or some heavier fluid is pumped up to be discharged against curved plates, and thus propel a vessel. Several complicated modifications of the plan are described.

(Reference is made to a Patent in A.D. 1853, N° 2290; but it does not relate to Marine Propulsion.)

[Printed, 2*s*. 6*d*. Drawings.]

A.D. 1854, February 16.—N° 376.

PRITCHARD, James.—(The Patent is void from want of notice to proceed.) Screw propeller. Directions are given for constructing the blades, but they are not intelligible.

The propeller-shaft and the engine driving-shaft may be disconnected, and a third shaft carries a wheel which may be geared into wheels on both the other shafts.

[Printed, 3*d*. No drawings.]

A.D. 1854, February 25.—N° 466.

ELDER, John.—Marine engines. The cylinders are on one side and the air-pumps on the other side of the propeller-shaft.

The piston has four piston-rods, which carry a crosshead, and may be prolonged so that two (diagonally placed) serve as the air-pump rods, and the upper pair are rods for the feed and bilge pumps.

[Printed, 10*d*. Drawings.]

A.D. 1854, February 27.—N° 471.

FOUGERAT, Pierre (Peter).—(The Patent is void from want of notice to proceed.) Paddle-wheels. Some geometrical and algebraic propositions are considered, but no practical explanation is given of what the invention consists in.

[Printed, 3*d*. Drawings.]

A.D. 1854, March 1.—N° 504.

TRUSCOTT, Thomas, and BAKER, Thomas Palmer.—Marine engines. There are two pairs of horizontal cylinders. Each pair has the piston-rods turned from the propeller-shaft and carrying a crosspiece with a connecting rod from it to the shaft-crank. This connecting rod works between the cylinders. A condenser is placed at each side of the shaft alongside the cylinders.

[Printed, 1*s*. 8*d*. Drawings.]

A.D. 1854, March 8.—N° 549.

EDINGTON, James Charles.—(The Patent is void from want of notice to proceed.) Gas is to be exploded in a cylinder, so as to raise a piston, which may work machinery.

[Printed, 3*d*. No drawings.]

A.D. 1854, March 11.—N° 597.

BUCHANAN, John.—Screw propeller. Bars of a frame adjustable round the propeller are brought near to the forward edge of the propeller-blade so that in revolving it will cut cordage or other materials that may be entangled about the propeller. There are two separate propeller shafts, one above the other, and both geared so that either can be turned by the engine and the propeller may be placed on one or the other as may be most convenient.

[Printed, 1*s*. 3*d*. Drawings.]

A.D. 1854, March 25.—N° 700.

NEILSON, Walter.—Marine engines. The condenser is made of long narrow chambers exposed to a current of water as the vessel moves.

[Printed, 7*d*. Drawings.]

A.D. 1854, April 3.—Nº 757.

SCOTT, Thomas.—A piston acts directly on the water, through a horizontal cylinder at the bottom of a vessel.

[Printed, 9*d*. Drawings.]

A.D. 1854, April 6.—Nº 788.

WESTON, John.—A flexible tube laid along a railway is inflated with air or steam so as to force along a wheel resting upon it, and thus to propel carriages or tow boats on a canal.

A flexible tube inside a metal tube is alternately inflated and exhausted, and thus acts as a pump by which water may be discharged to propel a vessel.

[Printed, 9*d*. Drawings.]

A.D. 1854, April 6.—No. 791.

DE BERGUE, Charles.—A horizontal channel like a long box open fore and aft is attached, under water, at each side of a vessel, and a flat broad vane is moved inside it in a manner described (but not intelligible without the drawings) so as to produce a constant stream of water in one direction or the other, according to the way the crank turns. Various modifications of the plan are described.

[Printed, 1*s*. Drawings.]

A.D. 1854, April 12.—Nº 856.

CRUGER, Lewis.—(The invention did not proceed to the Great Seal.) Screw propeller. The propeller-shaft has a universal joint in it, so that it may be turned to one side or the other, and used for steering without a rudder or astern of the rudder in a manner not described.

[Printed, 3*d*. No drawings.]

A.D. 1854, April 25.—Nº 944.

DANCHELL, Frederich Ludewig Hahn.—(The invention did not proceed to the Great Seal.) Motive power is to be obtained for propulsion on land and water by steam injected into tubes and acting in a manner not explained.

[Printed, 3*d*. No drawings.]

A.D. 1854, April 25.—N° 950.

GOUCHER, John.—(The Patent is void from want of a Specification.)

Collapsing or duck-feet propellers on vertical rods vibrating in the water. For backing the vessel, the rods are jointed so as to allow each propeller to be turned round.

[Printed, 3*d*. No drawings.]

A.D. 1854, April 27.—N° 954.

GRAVATT, William.—(The invention did not proceed to the Great Seal.) Water is discharged by the pressure of pistons or of a column of water.

[Printed, 3*d*. No drawings.]

A.D. 1854, April 27.—N° 959.

GREEN, Richard.—(The Patent is void from want of notice to proceed.)

A submerged wheel has paddles which are feathered as they pass one way by cam surfaces acting on their stems.

[Printed, 3*d*. No drawings.]

A.D. 1854, May 9.—N° 1035.

LIDDELL, Charles.—(The invention did not proceed to the Great Seal.)

Reciprocating tractive ropes to be used on canals in a manner explained in a former Patent.

The tow-lines may be attached to a swelling or enlargement on the rope so that the line may pass a guiding flange or pulley required at a bend of the river without allowing the main rope to escape. This may also be effected by attaching the tow-line to the rope in such a manner as to be easily cast off when a post is to be passed. Another plan is to have a small truck on a railway to guide the rope.

(Reference is made to a Patent in A.D. 1853, N° 1685; see *ante*, p. 252.)

[Printed, 3*d*. No drawings.]

A.D. 1854, May 10.—N° 1043.

***WILLIAMS*, William.**—Screw propeller. The boss is conical, *with the lesser* end forward, and it has grooves or channels cut upon it to facilitate the passage of the water. A conical tube fits over the boss and has similar openings formed in it for the same purpose. The blades are fixed to this conical tube by angle iron, and they are not true spirals, but their pitch is increased towards the fore part of the shaft.

[Printed, 9*d*. Drawings.]

A.D. 1854, May 13.—N° 1072.

BARSANTI, Eugène, and MATTEUCCI, Felix.—(The invention did not proceed to the Great Seal.)

Pistons are worked in cylinders by a mixture of hydrogen gas and common air, which is exploded by an electric spark, so as to work either with high pressure or by creating a vacuum and using atmospheric pressure. The motion is communicated to pallets acting on the water and folding during the return stroke.

[Printed, 3*d*. No drawings.]

A.D. 1854, May 22--N° 1134.

ENGLAND, William. — For rotary propellers acting by the production of a current of water. There is a cylindrical case within which a drum revolves, and the shaft of the drum (which passes through the outer case) is bent or cranked inside so as to move leaves or vanes excentrically through slits in the interior drum, which, by its rotation, will produce a current by the action of the sliding vanes.

[Printed, 9*d*. Drawings.]

A.D. 1854, May 31.—N° 1205.

DE PENNING, George Alfred.—Screw propeller. A cylindrical or semi-cylindrical guard is fixed round the propeller, so as to protect it from injury, and direct the water discharged sternwards.

[Printed, 5*d*. Drawings.]

A.D. 1854, June 2.—N° 1224.

ALDBOROUGH, Benjamin O'Neale Stratford, Earl of.—A vessel is propelled by wing-like sails, urged by springs in conjunction with vacuum chambers and numerous other contrivances described at length.

In another form the propulsion is effected by an elastic propeller, acting in some manner like a rudder, and with or without valves, which are not particularly explained.

(Reference is made to a Patent in A.D. 1854, N° 224, referring only to aerial locomotion.)

[Printed, 1*s.* 10*d.* Drawings.]

A.D. 1854, June 5.—N° 1243.

BROOMAN, Richard Archibald.—Screw propeller. The blades have every point of their peripheries equidistant from the shaft; and a flange turned sternwards is so applied as properly to confine the water, and prevent it from being thrown off by centrifugal action.

[Printed, 5*d.* Drawings.]

A.D. 1854, June 6.—N° 1253.

BAILLIE, William James.—A horizontal bar, carrying vertical floats, is mounted at each side on the cranks of two horizontal shafts across a vessel.

[Printed, 10*d.* Drawings.]

A.D. 1854, June 19.—N° 1333.

BAUER, William.—(The Patent is void from want of notice to proceed.) Driving screws, paddle-wheels, or other propellers, by fans or rotating sails. The keel is so divided that the propeller shaft of a screw may be inclined at an angle of about 10 degrees with the water.

[Printed, 3*d.* No drawings.]

A.D. 1854, June 23.—N° 1383.

BELLFORD, Auguste Edouard Loradoux.—A flat-bladed propeller, like an oar, is caused to vibrate to and fro at each side of a vessel, with its spindle nearly vertical, and the blade is feathered by the action of a rod and crank attached to it at the upper part. The blade has also a motion to and fro through a small angle across the line of the vessel's direction, the whole operation being intended to imitate that of the wing of a bird or the tail of a fish.

[Printed, 7d. Drawings.]

A.D. 1854, June 24.—N° 1398.

DAVIES, Joseph.—An endless chain revolves on horizontal axes placed across the direction of the keel, in a recess underneath a vessel, which is open to the water.

The chains carry small wheels and floats, which assume a vertical and horizontal position (as the chain turns) by the action of fixed guides.

[Printed, 9*d*. Drawings.]

A.D. 1854, July 1.—N° 1444.

JOHNSON, John Henry.—Submarine vessel. This is built with several compartments, and doors unite them and allow the crew to work in some open to the water, but with a stratum of air confined above, as in a diving-bell. An external heavy weight is lowered to the bottom of the water, so as to govern the movements of the boat when nearly stationary. Water is also to be pumped in or expelled as moveable ballast. Propulsion is effected by a screw propeller turned by a steam-engine. The fuel used is a chemical composition, and the gaseous products of the furnace are to escape through valves into the water outside. The air for respiration is purified by agitation with water or with an alkaline solution. Oxygen and condensed air may also be carried and used as required.

[Printed, 1*s*. 5*d*. Drawings.]

A.D. 1854, July 3.—N° 1453.

NEWTON, Alfred Vincent.—(This invention did not proceed to the Great Seal.) Marine engines. A screw-propeller shaft is turned by cranks from rock shafts, which receive a reciprocating motion from two steam cylinders placed transversely very near the vessel's bottom, one on each side.

[Printed, 3*d*. No drawing.]

A.D. 1854, July 5.—N° 1473.

BURCH, Joseph.—Marine engines. Two or more cylinders are united end to end, and their pistons connected by a single piston-rod passing through them all. Each cylinder has its own valve motion, and the steam may be used at the same pressure in all, or one or more may be worked expansively. When two sets of cylinders are placed in a line and at opposite sides of the shaft, they may be caused to move a cross-head, to which their piston-rods are attached. This cross-head has an opening which allows the shaft crank to play inside it, and the crank carries a square piece, which has a transverse motion in guides in the cross-head; so that the shaft is turned without a connecting rod by fixed cylinders.

A peculiar mode of stuffing is also described.

[Printed, 2*s.* 5*d.* Drawings.]

A.D. 1854, July 29.—Nº 1681.

WALDUCK, HENRY.—Screw propellers. The blades are corrugated or grooved, with indentations concentric with the shaft.

[Printed, 6*d.* Drawings.]

A.D. 1854, August 1.—Nº 1690.

BOUNEAU, JULES FREDERIC.—(The Patent is void from want of notice to proceed.) Endless chains carrying vertical floats at each side of a vessel turn on horizontal transverse rollers.

[Printed, 3*d.* No drawings.]

A.D. 1854, August 18.—Nº 1810.

NEWTON, ALFRED VINCENT.—(The Patent is void from want of notice to proceed.) A propeller shaft is turned by a crank, and a connecting rod which passes either between two cylinders to a cross-head attached to these piston-rods, or inside an annular cylinder to a cross-head carried by two piston rods attached to the annular piston.

[Printed, 3*d.* No drawings.]

A.D. 1854, August 22.—Nº 1844.

BUCHANAN, JOHN.—(The Patent is void from want of notice to proceed.) Marine engines. The piston-rods turn the crankshaft by connecting rods attached to cross-heads moving at the end of the cylinder most remote from the shaft.

[Printed, 3*d.* No drawings.]

A.D. 1854, September 7.—Nº 1953.

LUND, HENRY.—Paddles, in the form of oars which can be feathered by turning on their spindles, are actuated by levers, *cranks,* and rods, combined in several different modes.

The oars are feathered by cams, which may be worked by separate cylinders, either with steam or condensed air. By altering the time of feathering, the vessel may be backed astern without reversing the main engine. The shafts carrying the apparatus pass through a bearing of an angular shape to which they are kept by springs so as to prevent the entrance of water. Oars worked as above described may be applied as rudders.

(Reference is made to a Patent in A.D. 1851, Nº 13,610; see *ante*, p. 227.)

[Printed, 2*s.* 1*d.* Drawings.]

A.D. 1854, September 8.—Nº 1962.

MACALLISTER, Robert.—(The Patent is void from want of a Specification.) Screw propeller. On each side of the propeller shaft, and both in front of and behind the propeller, a guard or screen is fitted of a semicircular section, but tapering away to a point by which the centre part of the blades are, as it were, cut off from action. The precise position of this guard is not indicated more specifically.

[Printed, 3*d.* No drawings.]

A.D. 1854, September 11.—Nº 1977.

PALMER, Edward.—Screw propeller. The boss carries four arms, connected near their ends by curved stays nearly concentric with the shaft.

Another set of similar but shorter arms are fixed on another boss at a short distance from the former one, and a diagonal rod connects the outer end of each of the longer arms with the curved stays of the shorter arms. The blade is supported by sliding in a groove in this rod, and may be secured by a bolt.

There are also other rods from the short set of stays to the longer arms in a direction parallel to the shaft.

[Printed, 5*d.* Drawings.]

A.D. 1854, September 12.—Nº 1987.

WILLIAMS, Joseph.—(The Patent is void from want of notice to proceed.) Screw propeller. There are two broad flat blades, and each has at its outer edge a flange projecting sternwards.

[Printed, 5*d.* Drawings.]

A.D. 1854, October 2.—N° 2114.

PENN, John.—The bearings of the propeller shaft under water are so arranged that fillets of lignum vitæ or some other wood are fixed in dovetail grooves, and thus the rubbing surfaces consist of wood working on metal or brass. The fillets of wood are not close together, but so far apart as to allow a free flow of water about them.

[Printed, 8*d*. Drawing.]

A.D. 1854, October 16.—N° 2213.

WAIN, William.—Screw propeller. Each blade turns on its radial axis in the boss, where it carries a bevil wheel worked by another similar wheel, which may be turned round as required by a rod passing through the propeller shaft (hollowed for the purpose) and squared at the end, so as to take into a square hole in the axle of the last wheel.

This rod carries at the other end a wheel turned by a spindle and screw, the position of which being indicated by a pointer, will show the angle at which the propeller blade is placed. The rod presses against an elastic cushion, which keeps it up to the square hole in the wheel axle. The rod may be drawn back (sliding in the hollow shaft) by a rack and wheel, and then the shaft itself being drawn back from a squared hole in the boss, the propeller may be unshipped. When only two blades are used their ends may lock into each other for mutual support.

[Printed, 10*d*. Drawings.]

A.D. 1854, October 17.—N° 2224.

GREEN, Richard.—Feathering paddles. A wheel revolves horizontally or vertically in a case open partly to the external water at the side or below a vessel. The wheel carries paddles which turn on their radial axes, and are feathered by the action of cam guides acting on tappets.

[Printed, 10*d*. Drawings.]

A.D. 1854, October 23.—N° 2253.

HALES, Henry.—Screw propeller. When the engines working a paddle shaft are to be used for a screw-propeller shaft the motion may be communicated by an excentric on the paddle-shaft working a connecting rod, which turns a crank on the propeller shaft immediately beneath it, or by a bell-crank interposed so as to lead the power horizontally sternwards. Several bands or straps are used instead of one for gearing drums, and modes are suggested for tightening them.

Two propellers are to be used upon the same shaft, one in the deadwood and the other abaft the rudder-post. The blades of one propeller may be at right angles to the other.

[Printed, 6*d*. Drawings.]

A.D. 1854, November 1.—N° 2321.

RAE, James.—Screw propeller. The bearings are supported by vertical metal rods, which may be adjusted by screws. The forward bearing is thus lowered until it rests on a bracket fixed to the stern-post, where it is secured by screws. By these means the propeller bearings are not always deranged by the twisting of the stern-post or rudder-post or other injuries.

[Printed, 1*s*. 10*d*. Drawings.]

A.D. 1854, November 7.—N° 2349.

WORTS, James King, WORTS, James, and PAGE, Isaac.—(The Patent is void from want of notice to proceed.) Machinery is to be worked by a pendulum kept swinging "by hand or other mechanical means."

[Printed, 3*d*. No drawings.]

A.D. 1854, November 7.—N° 2350.

LANGLOIS, Louis Napoleon.—Paddle-wheels. The floats are inclined at an angle to the shaft to one side and the other alternately. A turbine at each side of the vessel supplies water to the paddle-wheels.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1854, November 13.—N° 2403.

ABADIE, Ismaël Isaac.—Screw propeller. The shaft is divided, so that the propeller may be turned by gearing while its axis is altered in position. This is effected by a wheel on the driving shaft turning one on an upright shaft which works one on the propeller shaft. The upright shaft is mounted in a step keel, and is that to which the propeller-frame and propeller are fixed, so that they may be turned by wheelwork on the deck above, as in the case of a rudder. The rudder may be connected with this wheelwork so as to work in addition to the steering propeller. The intermediate wheel by which the propeller is turned may be thrown out of gear, and the propeller driven by connecting the two detached portions of the shaft by suitable clutches. The particular means for effecting all these purposes are explained.

[Printed, 11*d*. Drawings.]

A.D. 1854, November 16.—N° 2432.

HANN, WILLIAM.—Windmills on deck turn a screw propeller by suitable gearing.

[Printed, 6*d*. Drawings.]

A.D. 1854, November 21.—N° 2461.

HUNT, EDMUND.—Screw propeller. The blades are portions of helices such that the outer portions are further forwards than the central portion. Several forms of blades are described, being helical surfaces cut off between two cones with a common axis. Directions are given for constructing these, and shaded drawings represent them.

The blades consist of several sets of ribs or curved wrought iron rods, which turn on the shaft, and thus stretch a flexible covering of india-rubber or gutta percha. The bosses of the ribs may be kept at intervals from each other by rings of wood or elastic material. If the shaft and bosses have corresponding grooves and screwthreads, the strain will be lessened on the elastic covering.

Various contrivances for swivelling the blades. The blades turn on their radial axes by bevil wheels worked by a wheel on a hollow shaft external to the propeller shaft. The driving shaft is caused to turn the propeller shaft by binding to it as the revolution of the first screws both together, and compresses a spring or elastic collar. Part of the shaft will therefore turn round through a small angular space before the whole moves regularly. This preliminary motion causes the wheel on the hollow shaft to turn the blades, and as a corresponding motion in the opposite direction will be given by the action of the spring again expanding when the engine stops, the blades will be again turned to the position they ought to assume when at rest. A hand movement sets the blades to any angle by means of a clutch box. In another plan the boss may be loose, and move round to a certain extent on the shaft, so as to turn the blades to a proper angle by a bevil wheel fast on the shaft taking into the wheel on each blade. When the engines are stopped, the boss by turning back will bring the blades back to their proper stationary position fore and aft. The movement of the boss on the shaft may be made slightly longitudinal, so as to compress a spring which will move it back when the engine stops. And this longitudinal movement may be in opposition to the direction of the horizontal thrust of the shaft. In another plan the radial axis of each blade (on which it turns), does not pass through its centre, and therefore the rotation of the propeller would alter the pitch of the blade, but the boss is allowed to turn to a certain extent so as to alter the pitch of the blade in the opposite direction by the means before directed, and these two tendencies will so balance each other as to place the blade at the most effective angle. Belts and pullies are applied in some cases.

The compression of a spring on the coupling of the shaft may be used to regulate the throttle valve of the engine at the same time as the pitch of the blades are regulated. The rudder of a screw steamer is placed in the bows.

Various particular directions are given with relation to the forms of steamboats.

[Printed, 2*s.* 2*d.* Drawings.]

A.D. 1854, November 21.—N° 2513.

HYDE, John Moore.—1. Screw propeller. There is only one blade, and when the shaft is at rest the blade is vertical, and sliding plates fill up the sides of the aperture for the propeller.

2. Improvements in steam-engines.

[Printed, 10*d.* Drawings.]

A.D. 1854, December 9.—N° 2591.

MORRISON, Richard James.—(The invention did not proceed to the Great Seal.) Screw propeller. The propeller is applied at the fore part of the vessel in front of the actual cutwater, and with a bearing on a false cutwater. "The employment of two propellers "in such fore part of the vessel, one placed over the other."

[Printed, 3*d.* No drawings.]

A.D. 1854, December 14.—N° 2635.

SCOTT, William Charles.—Paddle-wheels. The floats are inclined at an angle to the shaft, but their ends have their edges radial, so that each float is twisted. The floats are inclined alternately in opposite directions, and cross one another at a point equidistant from each side rim of the wheel.

In another plan, the floats, which are flat, are hinged to each side of the wheel, and by the action of the water place themselves at an angle to the shaft, on one side or the other, as the wheel may be turned; bars prevent them from moving farther. In this case they are in pairs, and so short that their ends are apart and leave a space between them in the middle of the wheel, so that the water is not lifted. The floats to be used thus may also be twisted as those described above.

[Printed, 10*d*. Drawings.]

A.D. 1854, December 18.—N° 2669.

PRITCHARD, James.—Screw propeller. The blades have the central part perpendicular to the shaft, but the other parts on each side are curved, and part of the central portion of the blade is cut away.

[Printed, 6*d*. Drawings.]

A.D. 1854, December 19.—N° 2672.

FALGUIERE, Jean Baptiste.—Two cylinders, with pistons and their rods, carrying a cross-head, work vibrating beams fore and aft, and each of these carries a frame with floats, which feather by the action of the water. The feathering motion may be reversed by a rack and stops acting on all the floats, by which the engine may be made to propel the vessel astern.

[Printed, 10*d*. Drawings.]

A.D. 1854, December 26.—N° 2723.

BLYTHE, Philip Patton.—(The Patent is void from want of notice to proceed.) Screw propeller. India-rubber and gutta percha, in conjunction with metal or other material, may be used for the construction of screw propellers.

[*Printed, 3d.* No drawings.]

A.D. 1855, January 2.—N° 11.

PEACOCK, George.— Screw propeller. The blades are of wrought iron, and of a shape like that of a bee's wing, or parabolic in their curvature. There are several stay-rods to secure them, and particular directions are given as to how the parts may be united.

The shaft may be detached, and the propeller hoisted by chains from above, which draw up the frame travelling in guides.

[Printed, 10*d*. Drawings.]

A.D. 1855, January 9.—N° 57.

HALL, John Henry, DALGETY, Alexander, and LEDGER, Edward.—(The Patent is void from want of notice to proceed.) Water forced through tubes, or paddle-wheels at the bow and stern, on axes in the line of the keel, may be used to propel and steer the vessel.

[Printed, 3*d*. No drawings.]

A.D. 1855, January 9.—N° 59.

MAJOR, William.—(The Patent is void from want of notice to proceed.) Screw propeller. The blades are feathered by a transverse nut in the boss and a screw-spindle worked through the hollow propeller shaft.

The spindle may be worked by a bevil-wheel gearing into another on a spindle perpendicular to the shaft. A slot on the end of the shank of the blade has working in it a stud-pin attached to the nut. As the spindle is turned the nut causes the stud-pin to turn the blade on its axis.

In another plan, a spiral groove on each shank is worked by a stud-pin on the traversing-nut, which is moved by a screw-spindle on the side of the main boss, and this is turned by a long key so as to cause the stud-pin to rise or fall in the spiral grove, and thus turn the blade. By a nut and spindle the blade may be so raised out of the socket as to cause it to be loose and ready for the foregoing operations.

[Printed, 3*d*. No drawings.]

A.D. 1855, January 20.—N° 158.

BELLFORD, Auguste Edouard Loradoux.—Paddle-wheels. The floats are fixed in pairs by hinges on each side of one central rim without other side rims. They take their positions by the action of the water, and enter the water with the hinge-part first, and the float on each side bent back at an angle. This position is reversed when the shaft is turned the other way. The hinges may be so set as to make the floats open to any required angle, or the floats may be rigidly secured in their position by stays from their outer edges.

[Printed, 6*d*. Drawings.]

A.D. 1855. January 26.—N° 206.

JOHNSON, John Henry.—Kites are made of sailcloth or other material stretched on two rods crossing each other, and which may be turned round parallel and folded in the cloth. The tail has pallets which present flat surfaces to the wind. Directions are given for attaching the main cord to the bellyband. The string is tied to a float in the water so as to draw it along either to leeward or in an oblique direction, and a tow-rope from this float may be used for other purposes.

[Printed, 7*d*. Drawings.]

A.D. 1855, January 30.—N° 232.

WARREN, David.—(The Patent is void from want of notice to proceed.) Screw propeller. The blade is shaped so that a section at right angles to the shaft will be a parabola, with the more concave part of the curve near the boss. A flange may be added on in the outer edge. The blades should not be sections of circles, but narrower on their faces.

[Printed, 3*d*. No drawings.]

A.D. 1855, February 2.—N° 249.

SOELMAN, William.—(The invention did not proceed to the Great Seal.) Screw propeller. The blades are flat sector vanes, for the construction of which minute directions are given. The shaft is turned by cranks worked by men, or by a windmill on deck.

(One of the drawings has a part represented on a slip of paper so *attached as to* stand out at an angle of 45°.)

[*Printed*, 7*d*. Drawings.]

A.D. 1855, February 6.—N° 274.

HOARE, Deane John.—Screw propeller. The shaft is inclined so that the inner end is higher than the other.

[Printed, 10*d.* Drawings.]

A.D. 1855, February 7.—N° 291.

CHATTERTON, Richard Dover.—(The Patent is void from want of notice to proceed.) Paddle-wheels. The floats are hollow cylinders which turn on their axes, and the wheels are larger than usual so that the cylinder floats may descend below the level of the keel.

[Printed, 3*d.* No drawings.]

A.D. 1855, February 10.—N° 321.

RENNIE, George.—Marine engines. The cylinders are horizontal and on opposite sides of the shaft. The cylinder of one engine is opposite to the air-pump of the other engine, which air-pump has a hollow plunger or trunk, and is in the centre of its condenser and worked by a connecting rod from the crank turned by the opposite cylinder and piston.

[Printed, 8*d.* Drawings.]

A.D. 1855, February 15.—N° 346.

DELABARRE, Christophe François. — Steam discharged from a small tube carries with it a certain portion of air and the united stream is conducted through a longer tube, and escaping from the end, it again draws air along with it.

After enumerating various purposes for which this may be used, it is said (page 14, line 20 of the printed Specification, and see Figure 36), that a vessel may be propelled by the discharge of steam putting water in motion horizontally; air may be used instead of steam.

[Printed, 1*s.* 3*d.* Drawings.]

A.D. 1855, February 21.—N° 384.

PIDCOCK, John Hyde.—An elastic band or belt is caused to move in an undulating manner in a channel under water so as to produce a current and discharge water or air for the propulsion of the vessel.

By vanes the steam may be regulated and directed so as to steer the vessel.

[Printed, 10*d.* Drawings.]

A.D. 1855, March 3.—N° 475.

REVELL, JOSEPH.—(The invention did not proceed to the Great Seal.) Feathering paddles. Each float turns on a horizontal axis and is feathered by a spur pinion at the end of its axis geared into a large cog-wheel properly attached to the paddle shaft.

[Printed, 3*d*. No drawings.]

A.D. 1855, March 14.—N° 573.

SOELMAN, WILLIAM.—(The Patent is void from want of notice to proceed.) Screw propellers. One portion of each blade is curved at a different angle from the rest. Pieces are added as rims or projections on the blades.

The directions given for these constructions are not intelligible.

[Printed, 5*d*. Drawings.]

A.D. 1855, March 19.—N° 609.

HOWSON, RICHARD.—(The Patent is void from want of notice to proceed.) 1. Screw propeller. The blades have a particular form, which the description does not explain intelligibly.

2. A particular form for the bow lines of vessels.

3. Canal boats, with the stern of each concave, and admitting the bow of the boat behind it.

[Printed, 3*d*. No drawings.]

A.D. 1855, March 22.—N° 633.

LECOUR, TELL CLAUDE FRANÇOIS.—(The Patent is void from want of notice to proceed.) A vessel is propelled on a canal by an endless rope worked by a water-wheel turned by the water flowing from a higher level, or by a steam-engine.

[Printed, 7*d*. Drawings.]

A.D. 1855, March 22.—N° 634.

BIDEN, JAMES.—Marine engines. The steam is condensed by passing through tubes which are led outside the vessel or through passages inside, kept cool by a flow of sea water, and the condensed *fresh* water is used for the boiler.

[Printed, 3d. No drawings.]

A.D. 1855, March 28.—N° 687.

REVELL, JOSEPH.—(The Patent is void from want of notice to proceed.) Feathering paddles. Each float turns on a horizontal axis, and is secured by a stud to a rim mounted on the main shaft, and to another working on a fixed centre above that of the shaft. The mode by which this centre is fixed is not explained.

[Printed, 3*d*. No drawings.]

A.D. 1855, March 28.—N° 690.

McLOW, THOMAS.—Screw propeller. Directions are given for constructing the blades of a certain hollowed form. Two pairs of double blades may be used, in which case one pair turning loosely on the shaft is by the action of the water moved up near to the other fixed pair, so as to be secured by clutches retaining it either at right angles or parallel to the other pair of blades in a vertical position. It is not stated how the loose pair may be kept from moving longitudinally on the shaft. The after pair of blades (which is the loose pair) ought to be at some distance from the other. The boss is to be made very small.

[Printed, 7*d*. Drawings.]

A.D. 1855, April 3.—N° 743.

TOOTH, WILLIAM HENRY. — Screw propeller. The steam machinery is placed in a trough-like chest occupying the position of the keel of the vessel which has a nearly flat bottom on each side. Instead of cylinders there are oblong chests with piston-rods, carrying a cross-head, working in guides. The cross-head has a reciprocating part moving transversely, and embracing the crank on the shaft, which is thus turned without a connecting rod. Other particulars relating to the engine and boiler are described. The blades of the propeller may be feathered by turning a spindle with a screw on it, which works a bevil wheel, taking into a bevil wheel on the shank of each blade.

[Printed, 1*s*. Drawings.]

A.D. 1855, April 12.—N° 810.

WILHELMY, FERDINAND.—(The invention did not proceed to the Great Seal.) Paddle-wheels. The floats present concave surfaces to the water whichever way the wheel turns. This is done by curving the floats, or applying flanges at each side.

[Printed, 3*d*. No drawings.]

A.D. 1855, April 13.—N° 817.

WEALLENS, WILLIAM, and CROW, GEORGE ARTHUR.—(The Patent is void from want of notice to proceed.) Marine engines. The shaft is between the cylinder and the air-pump. The piston-rods pass through the air-pump, and work back upon the shaft in a manner not described.

[Printed, 3*d*. No drawings.]

A.D. 1855, April 13.—N° 818.

REVELL, JOSEPH.—(The invention did not proceed to the Great Seal.) Feathering paddles. Each float turns on a horizontal axis, and is feathered by a small crank at the end, worked by a ring turning excentrically on the shaft.

[Printed, 3*d*. No drawings.]

A.D. 1855, April 14.—N° 827.

HERBERT, JANE ANNE.—(The invention did not proceed to the Great Seal.) Two wheels carrying folding paddles revolve near each other, while their axes are inclined nearly at an angle of 120 degrees. The paddles act on the water during one part of the revolution, and are feathered by the wheel as they come round the other way. The precise position of the apparatus is not described.

[Printed, 3*d*. No drawings.]

A.D. 1855, April 19.—N° 871.

LEAR, PETER.—Submerged paddle-wheels revolve on vertical axes at each side of a vessel, and a "guard" in form of each directs the water, so that by centrifugal action it is discharged nearly parallel to the vessel's line of direction. Air or water is admitted *to the revolving* wheels by a tube at the centre.

[Printed, 7d. Drawings.]

A.D. 1855, April 24.—N° 910.

TAYLOR, Joseph.—(The Patent is void from want of notice to proceed.) Any kind of propeller is to be worked by spur-wheels turned by manual power.

[Printed, 3*d*. No drawings.]

A.D. 1855, April 30.—N° 964.

BURNS, Robert.—(This invention did not proceed to the Great Seal.) Vertical floats on horizontal rods worked by cranks on several shafts across a vessel.

[Printed, 3*d*. No drawings.]

A.D. 1855, May 4.—N° 1001.

TROTMAN, John.—(The Patent is void from want of notice to proceed.) Screw propeller. Gutta percha or vulcanized india-rubber may be used.

[Printed, 3*d*. No drawings.]

A.D. 1855, May 12.—N° 1072.

ADAMS, William Bridges.—1. Construction of iron vessels with two shells connected by bolts or otherwise.

2. Construction of paddle-wheel and propeller shafts, by welding short pieces together under the heat produced by gas.

3. India-rubber or elastic material is introduced into paddle-wheels or shaft machinery, so that the power transmitted must be exerted first upon the india-rubber, by stretching it or squeezing it in the form of loops, bands, plugs, wedges, or teeth.

4. Lighting vessels by oil-gas produced on board.

5. Air-chambers worked by the engine and used to blow whistles or trumpets for signals, or to throw shot from a gun.

[Printed, 11*d*. Drawings.]

A.D. 1855, May 14.—N° 1084.

PETTIGRUE, James.—Pistons acting directly on the water in submerged tubes are worked by other pistons in steam cylinders.

[Printed, 10*d*. Drawings.]

A.D. 1855, May 21.—Nº 1136.

CURTIS, William Joseph.—(The Patent is void from want of notice to proceed.) Kites or balloons, inflated by gas from gunpowder or "similar compound," may be used to propel a vessel, and for other purposes.

[Printed, 3*d*. Drawings.]

A.D. 1855, May 21.—Nº 1137.

WHITAKER, Harry.—Screw propeller. There is a propeller at each side turned by a steam-engine outside the vessel. The propeller shaft is not submerged.

[Printed, 6*d*. Drawings.]

A.D. 1855, May 23.—Nº 1162.

McLOW, Thomas.—(The invention did not proceed to the Great Seal.) Feathering paddles. Each float turns on a horizontal axis by rods from an excentric, the position of which may be altered so as to adjust the angular position of the floats.

[Printed, 3*d*. No drawings.]

A.D. 1855, May 24.—Nº 1178.

McLOW, Thomas.—(The invention did not proceed to the Great Seal.) Paddle-wheels. The floats are fixed "in an angular position."

[Printed, 3*d*. No drawings.]

A.D. 1855, May 29.—Nº 1234.

McLOW, Thomas.—(The invention did not proceed to the Great Seal.) Screw propeller. Directions are given for constructing the blades, but their form is not explained. "A double "or auxiliary propeller" may be used, but the mode is not explained.

[Printed, 3*d*. No drawings.]

A.D. 1855, June 15.—Nº 1364.

HEWITT, William.—Screw propeller. The blades are feathered by a bevil wheel on a hollow shaft working over the propeller shaft, and which wheel turns bevil cog sectors on the blades.

The blades have their shanks screwed into the boss, and to remove them, if desired, a key fits into a female screw left on the blade, so that the blade may be turned round, and thus be unscrewed.

[Printed, 10*d.* Drawings.]

A.D. 1855, June 16.—N° 1376.

LOWE, James.—Screw propeller. The blades are not all to spring from the same circle about the shaft, but in sets, one astern of the other. Directions are given for constructing the blades of each set in a particular form.

The boss may be elliptical.

[Printed, 10*d.* Drawings.]

A.D. 1855, June 18.—N° 1382.

BESSEMER, Henry.—Screw propeller. The propeller and shafts, and cranks, may be made of cast steel and pig iron.

(Reference is made to a Patent in A.D. 1855, N° 1384, not relating to Marine Propulsion.)

[Printed, 4*d.* No drawings.]

A.D. 1855, June 22.—N° 1439.

PENRICE, Herbert Newton.—A horizontal shaft across a vessel carries cranks which move rods nearly horizontal, so as to urge broad vanes at their ends against the water. The vanes then leave the water and are drawn back through the air by the action of a rocking beam, on which each rod slides.

[Printed, 9*d.* Drawings.]

A.D. 1855, June 27.—N° 1467.

SWINBURNE, Thomas.—1. Machinery for applying power to a toothed wheel.

2. Paddle-wheels. These are to be turned by the power obtained from the revolution of a second set of "regenerating paddles" mounted on a shaft behind the others, and caused to turn by the motion of the vessel through the water.

[Printed, 11*d.* Drawings.]

A.D. 1855. July 18.—N° 1615.

TRAPP, Thomas.—Disconnecting apparatus. One part of the shaft carries at the end a hollow ring with wedge-shaped keys, which may be tightened so as to grasp an inner ring carried by the other part of the shaft. The construction is particularly explained and shown in the drawings, but without these it would be unintelligible.

[Printed, 6*d*. Drawings.]

A.D. 1855, July 19.—N° 1627.

LAWRIE, James Gray.—1. Marine engines. One cylinder is vertically over the shaft and the other is horizontal at one side. Both work by cross-heads from piston-rods through the ends of cylinders remote from the shaft.

2. Many parts of the steam-engine are described, and various alterations proposed for locomotive and for general purposes.

[Printed, 2*s*. 10*d*. Drawings.]

A.D. 1855, July 20.—N° 1646.

DESCHAMPS, Casimir, and VILCOQ, Charles.—" Free diving boat." This is propelled by a screw turned by hand-gearing. For respiration compressed air is carried. The boat is caused to rise and sink by inflating bellows with air or letting fall ballast. An electric light is at the top, and other particulars are described.

[Printed, 6*d*. Drawings.]

A.D. 1855, July 21.—N° 1660.

KENWORTHY, William Edward, and GREENWOOD, Henry.—(The Patent is void from want of notice to proceed.) Screw-propeller. The blades are fixed to the boss by dovetailing their ends into grooves. The end is then rivetted, or a bolt passed through to secure it.

[Printed, 3*d*. No drawings.]

A.D. 1855, July 25.—N° 1691.

WEALLENS, William, and CROW, George Arthur.—*Marine engines*. The air-pump, bilge-pump, and feed-pump are worked direct from the piston-rods of the cylinders, all being placed on the same level. The cranks are worked by connecting-rods from cross-heads. The engine is described in detail.

[Printed, 6*d*. Drawings.]

A.D. 1855, July 26.—N° 1693.

SCHIELE, CHRISTIAN.—Rotary engine. A propeller shaft may be turned by the action of steam directed against incisions in the circumference of a wheel upon the shaft. The wheel is in a case connected with a condenser. The steam impinges nearly tangentially on one side of each of the incisions, or of the curved vanes round the periphery, and it escapes by the open sides of the incisions into the case. A wheel or vane inside may be turned by this escaping steam, so as to indicate by a pointer outside the manner of its escape within the case. Water may be used instead of steam to turn the engine.

(Reference is made to a Patent in A.D. 1852, N° 13,965, which does not relate to Marine Propulsion.)

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1855, July 27.—N° 1708.

BENFIELD, JOHN AARON.—Screw propeller. This is placed in the rudder, and the shaft has a universal joint or (in large vessels) a hook and shackle connecting that part which moves in the rudder with the remainder inside the vessel. Other particulars are described, and cog-wheel apparatus to be used for turning the propeller by hand when applied to a boat.

[Printed, 7*d*. Drawings.]

A.D. 1855, August 10.—N° 1819.

LAGERGREN, PONTUS.—Feathering paddles.—The action is similar to that where an excentric rim governs floats turning on their horizontal axes.

One side rim of the wheel revolves on an axis above that of the other. In each rim there are corresponding holes, and bars with pins turning in these holes pass (at an angle with horizon) from one to the other rim. Each bar carries a float so placed that the bar constitutes the diagonal of the rectangular float. The floats will thereby be feathered. To prevent the outside rim from being strained by the twisting action of the float-bars, the centre of it is coupled to the shaft by a short shaft inclined to the horizon and furnished with universal joints.

(The word "horizontal" seems to be used by mistake at p. 1, line 13, of the printed specification.)

[Printed, 8*d*. Drawings.]

A.D. 1855, August 20.—N° 1883.

SOELMAN, William.—Screw propeller. The blades and boss are of various forms represented in the drawings. Longer and shorter blades are combined. In some cases a part of a projecting flange is attached to the face of a blade.

[Printed, 9*d*. Drawings.]

A.D. 1855, August 23.—N° 1904.

WYCHE, Thomas Eyre.—Screw propeller. Each blade is equally divided from the periphery to the boss, and one of the parts put to the right, the other to the left, of the diagonal line of the boss on which the base of the blade is cast when solid.

Thus a space is left between the parts.

Other directions are given, but not minutely, and there are no drawings.

[Printed, 3*d*. No drawings.]

A.D. 1855, September 5.—N° 2008.

CRAYMER, William.—Screw propeller. A hollow propeller shaft allows a second (solid) shaft inside to carry a bevil wheel acting upon a similar wheel on the shank of each blade. A ring goes through the surface of each blade, with a radial pin holding it to the blade, but with enough freedom of motion to allow the blade to be feathered.

Another plan places a ring outside the blades, and so that each is attached to it at the periphery by an axis square-headed, so as to be turned by a key. A "scoop-shaped" blade, with an aperture closed by a flap until the water "has supplied the fullest *resisting* medium for propelling."

[*Printed, 7d.* Drawings.]

A.D. 1855, September 5.—Nº 2010.

PALMIERI, Agostino, and FERRARI, Jean Baptiste.—Air-tight hollow cylinders, with floats on the outside, are attached so as to support a vessel and to propel it as they are turned round.

[Printed, 10*d*. Drawings.]

A.D. 1855, September 10.—Nº 2049.

BELLFORD, Auguste Edouard Loradoux.—(The Patent is void from want of notice to proceed.) Paddle-wheels. There is only one rim, which is central, and from it are supported and stayed at each side floats inclined at an angle in opposite directions. The floats enter the water first at those ends of each pair which are close together and attached to the centre rim.

[Printed, 3*d*. No drawings.]

A.D. 1855, September 18.—Nº 2109.

NEWTON, Alfred Vincent.—Padddle wheels. The floats are concave on the side that enters the water first, and flat on the other side.

The floats of the two wheels are so set that one of each enters the water alternately.

[Printed, 5*d*. Drawings.]

A.D. 1855, October 10.—Nº 2269.

TAYLOR, William Crees.—(The invention did not proceed to the Great Seal.) Marine engines. Two piston-rods, one working the air-pump, the other the hot-water pump, both of these being in the condenser. The outer ends of these piston-rods have a crosshead and connecting rod to the propeller-shaft crank.

[Printed, 3*d*. No drawings.]

A.D. 1855, October 11.—Nº 2271.

HERBERT, Jane Anne.—Paddle-wheels. Each wheel consists of two separate sets of spokes. Each set is fixed to a shaft and the shafts are slightly inclined to each other, and connected by a universal joint. The spokes thus turn so as to approach each other as they rotate towards the top of their revolution and diverge at the bottom. On each spoke there are floats at right angles to the water, but turning on pins in the spoke, and through the middle of

A.D. 1855. July 18.—N° 1615.

TRAPP, THOMAS.—Disconnecting apparatus. One part of the shaft carries at the end a hollow ring with wedge-shaped keys, which may be tightened so as to grasp an inner ring carried by the other part of the shaft. The construction is particularly explained and shown in the drawings, but without these it would be unintelligible.

[Printed, 6*d*. Drawings.]

A.D. 1855, July 19.—N° 1627.

LAWRIE, JAMES GRAY.—1. Marine engines. One cylinder is vertically over the shaft and the other is horizontal at one side. Both work by cross-heads from piston-rods through the ends of cylinders remote from the shaft.

2. Many parts of the steam-engine are described, and various alterations proposed for locomotive and for general purposes.

[Printed, 2*s*. 10*d*. Drawings.]

A.D. 1855, July 20.—N° 1646.

DESCHAMPS, CASIMIR, and VILCOQ, CHARLES.—" Free diving boat." This is propelled by a screw turned by hand-gearing. For respiration compressed air is carried. The boat is caused to rise and sink by inflating bellows with air or letting fall ballast. An electric light is at the top, and other particulars are described.

[Printed, 6*d*. Drawings.]

A.D. 1855, July 21.—N° 1660.

KENWORTHY, WILLIAM EDWARD, and GREENWOOD, HENRY.—(The Patent is void from want of notice to proceed.) Screw-propeller. The blades are fixed to the boss by dovetailing their ends into grooves. The end is then rivetted, or a bolt passed through to secure it.

[Printed, 3*d*. No drawings.]

A.D. 1855, July 25.—N° 1691.

WEALLENS, WILLIAM, and CROW, GEORGE ARTHUR.—*Marine* engines. The air-pump, bilge-pump, and feed-pump are

A.D. 1855, November 12.—N° 2549.

HENSON, William, and PALMER, Henry Oscar.—(The Patent is void from want of notice to proceed.) Paddle-wheel. This is carried at a vessel's stern on beams which may be raised or lowered, turning at one end upon the crank shaft of the engine.

[Printed, 3*d*. No drawings.]

A.D. 1855, November 13.—N° 2551.

WILSON, Fischer Alexander.—A set of vanes or paddles moved to and fro in the water and feathering as they collapse for the return stroke (by means not described). These may be worked by an engine consisting of cylinders alternately charged with air, water, or steam, or of cylinders and pistons worked by atmospheric pressure, and a vacuum obtained by condensing steam. The piston may communicate its motion from within the cylinder, by acting through an elastic part at one side. The apparatus is not intelligibly explained in its relation to the propulsion of vessels.

[Printed 1*s*. 5*d*. Drawings.]

A.D. 1855, November 17.—N° 2592.

HOSKING, John.—(The invention did not proceed to the Great Seal.) Marine engines. The air-pump, condenser, and condenser bottom are formed "in one piece, independently of the sole plate."

[Printed, 3*d*. No drawings.]

A.D. 1855, November 20.—N° 2611.

GEYELIN, George.—(The Patent is void from want of notice to proceed.) Pistons act directly on the water in cylinders under water at a vessel's stern.

[Printed, 3*d*. No drawings.]

A.D. 1855, November 27.—N° 2670.

TAYLER, Enoch.—Feathering paddles. Each float turns on a horizontal axis through one edge, and is divided in the middle, where the parts are both attached to a ring without a centre, and caused to move excentrically to the shaft by the action of roller guides, which may be shifted by rackwork so as to alter the angle at which each float enters the water.

[Printed, 6*d*. Drawings.]

A.D. 1855, December 8.—N° 2776.

EVENDALE, Andrew.—(The Patent is void from want of otice to proceed.) Paddle-wheels. The vessel is supported on ollow drums with floats upon them, which propel it as the drums re caused to revolve.

[Printed, 3*d*. No drawings.]

A.D. 1855, December 12.—N° 2810.

LEIGHTON, William.—Feathering paddles. Each float turns on a horizontal axis, and is feathered by the action of a wheel on an independent shaft excentric to the other shaft. The rim of this wheel acts on a small crank on the axis of each float.

[Printed, 6*d*. Drawings.]

A.D. 1856, January 1,—N° 4.

NEWTON, Alfred Vincent.—(The Patent is void from want of notice to proceed.)

1. Propulsion on land by air acting in tubes.
2. Air forced out under water to propel a vessel.

[Printed, 3*d*. No drawings.]

A.D. 1856, January 9.—No. 73.

ALEXANDRE, Lambert.—(The Patent is void from want of notice to proceed.) Frames work to and fro in channels under water, and carry paddles, which fold up for the return stroke.

[Printed, 3*d*. No drawings.]

A.D. 1856, January 17.—N° 129.

CHAPMAN, William.—Pistons act directly on the water in cylinders parallel with the keel.

[Printed, 6*d*. Drawings.]

A.D. 1856, February 4.*—N° 296.

PAULING, Richard Clarke.—(The Patent is void from w of notice to proceed.) Air is forced out under water to prop vessel. Compressed air is applied to exclude water from the h and for other purposes.

[Printed, 3*d*. No drawings.]

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* *In the printed* copies of the Specification the date is improperly *Feb. 14.*

A.D. 1856, February 6.—Nº 318.

NAPIER, George, and MILLER, John. — Screw propeller. The frame holding the propeller may be raised up or lowered to a depth below the keel, and the propeller shaft is worked by an upright shaft and bevil-gearing, which adjusts itself to the different elevations of the propeller.

[Printed, 10*d*. Drawings.]

A.D. 1856, February 9.—Nº 345.

DUNCAN, John Wallace.—1. Steam engines.

2. Screw propeller. (See Page 13, Line 21, of the printed Specification.) The blades may have a peculiar form represented in the drawings. The shaft has a universal joint, which allows the external part to be set at a small angle to the horizon, and the propeller is thus applied at the bow or stern. In another form, the ring which carries the blades may be adjusted so as to turn the shaft a little up or down on to either side for steering.

3. Screw-propeller raft. The raft consists of cylinders pointed at each end, and carrying screw threads round their outsides. As the cylinders float and revolve, the action of the lower immersed parts of the threads propel the raft. This is applied to locomotion on ice, and on land.

[Printed, 3*s*. Drawings.]

A.D. 1856, February 14.—Nº 384.

BARTHOLOMEW, William Hamond.—Marine engines. The boiler is above the propeller shaft, and the cylinders at each side are inclined at 45° to the horizon. Other parts of the engine are described.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1856, February 18.—Nº 410.

HALE, William.—(The Patent is void from want of notice to proceed.) A stream of fire from an inflammable composition in a tube is discharged through a contracted nozzle under water to propel a vessel.

[Printed, 3*d*. No drawings.]

A.D. 1856, February 20.—Nº 428.

LYNN, William.—Screw propeller. The blades are attached to the shaft by a knuckle joint like a door-hinge through which the shaft passes with a feather.

[Printed, 6*d*. Drawings.]

A.D. 1856, March 4.—Nº 551.

SAMUELSON, Martin.—Screw propeller. An aperture is made in each of the blades near the boss. The blade is a frame with an iron plate rivetted to it.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1856, March 6.—Nº 563.

PHILP, Richard.—(The invention did not proceed to the Great Seal.) Paddle-wheel. The floats are formed of a shape not intelligible from the description.

[Printed, 3*d*. No drawings.]

A.D. 1856, March 6.—Nº 564.

TISDALL, Thomas.—(The Patent is void from want of notice to proceed.) Horizontal vanes reciprocate under water.

[Printed, 3*d*. No drawings.]

A.D. 1856, March 13.—Nº 610.

DIXON, Isaac.—Screw propeller. The boss is of an oval shape, and the blades are nearly flat, with a rounded outline.

[Printed, 8*d*. Drawings.]

A.D. 1856, March 24.—Nº 692.

ROBERTSON, James.—Screw propeller. The gearing consists of wheels, with concentric grooves, acting by the friction of their surfaces.

The driving-wheel may be grooved on an internal flange, enclosing the driver-wheel. The driver-shaft may be raised by a wedge or otherwise, so as to throw its wheel out of gear. The *grooves* on two shafts may be in curves, so that an intermediate ring will cause one shaft to work the other at an adjustable relative speed.

In belt gearing an intermediate ring grooved internally, is turned by the strap, and acts upon the driver-wheel.

Clutch couplings, with annular grooves fitting into each other.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1856, April 2.—N° 796.

GALLOWAY, GEORGE BELL.—A paddle-wheel, with inclined floats, and a screw propeller, are combined with an apparatus to discharge air through tubes under water, for propulsion.

[Printed, 7*d*. Drawings.]

A.D. 1856, April 11.—N° 869.

BURNSIDE, JAMES.—Frames on horizontal rods, moved by cranks and excentrics so as to enter the water in a vertical position and to feather as they pass through the air for the return stroke.

[Printed, 10*d*. Drawings.]

A.D. 1856, May 1.—N° 1035.

PATERSON, ALEXANDER JOHN.—(The Invention did not proceed to the Great Seal.) Towing ropes or chains are to be made fast to elastic pieces on board a vessel to ease the strain.

[Printed, 3*d*. No drawings.]

A.D. 1856, May 17.—N° 1178.

CARTER, GEORGE.—Air is forced out under water through tubes so as to cause it to glide along the hull as far as possible before escaping.

[Printed, 7*d*. Drawings.]

A.D. 1856, June 2.—N° 1300.

PARKHURST, STEPHEN ROSSIN.—Paddle-wheel. The floats are disposed in diagonal lines, in opposite directions, forming boxes.

[Printed, 6*d*. Drawings.]

A.D. 1856, June 18.—N° 1440.

SHARPLEY, Caleb Perry.—Paddle-wheel. Instead of floats a spiral paddle goes round the wheel, which is called a screw paddle-wheel.

[Printed, 3*d*. No drawings.]

A.D. 1856, June 23.—N° 1465.

MILLER, William Valentine.—Pistons act directly on the water in horizontal tubes, under the bottom of a vessel.

[Printed, 5*d*. Drawings.]

A.D. 1856, July 1.—N° 1545.

BOUSFIELD, George Tomlinson.—Water is forced through tubes under a vessel's bottom, and by means of valves the force is directed to propel and steer the vessel.

[Printed, 2*s*. 1*d*. Drawings.]

A.D. 1856, July 16.—N° 1669.

BOURNE, John.—(The Patent is void from want of notice to proceed.) Feathering paddles. Each float turns on a horizontal axis, and is feathered by rods from two excentrics, one on each side of the wheel, and connected to small cranks upon the spindles of the floats.

[Printed, 3*d*. No drawings.]

A.D. 1856, July 24.—N° 1753.

PETSCHLER, Helmuth Carl Friedrich Martin.—(The Patent is void from want of notice to proceed.)

An internal cog-wheel and shaft are moved by " the principal of gravitation."

[Printed, 3*d*. No drawings.]

A.D. 1856, July 25, N° 1774.

ANDERSON, William Lanphier.—(The invention did not proceed to the Great Seal.) Feathering paddles. Each float turns upon its radial axis, and is feathered by cog-wheels or cams in a manner not explained.

[Printed, 3*d*. No drawings.]

A.D. 1856, July 26.—N° 1779.

PAULING, Richard Clarke.—Air is discharged under water through tubes to propel a vessel. By forcing air into a sunken or leaky vessel the water may be expelled from it after all apertures on deck are closed. Caissons made fast to a sunken vessel have the water expelled by pumping in air so that they float the vessel.

[Printed, 1*s.* 3*d.* Drawings.]

A.D. 1856, August 9.—N° 1880.

MARCH, Chapman.—Screw propeller. This is moved by a windmill on deck.

[Printed, 6*d.* Drawings.]

A.D. 1856, August 18.—N° 1928.

STOPPORTON, John.—Frames reciprocate under water and carry vanes, which feather for the return stroke.

[Printed, 10*d.* Drawings.]

A.D. 1856, August 23.—N° 1971.

MOSES, Alexander.—(The Patent is void from want of notice to proceed.) A propeller shaft worked by a circular flooring moved by horses.

[Printed, 3*d.* No drawings.]

A.D. 1856, September 4.—N° 2050.

BISHTON, William.—(The Patent is void from want of notice to proceed.) Paddle-wheels at a vessel's stern.

[Printed, 3*d.* No drawings.]

A.D. 1856, September 4.—N° 2055.

LEWIS, George Alfred.—Screw propeller. The propeller is lifted by sliding in grooved guides. It is secured at the bottom by a spring on each side, and when it has to be drawn up a framework is lowered along the guides, which pushes back the spring, while two rods entering holes are turned round so as to hook the propeller, which is drawn up by a screw and nut.

[Printed, 9*d.* Drawings.]

A.D. 1856, September 4.—N° 2062.

ALDBOROUGH, Earl of.—Some of the forms of wing-like propellers to be used in aerial locomotion are to be adapted to aquatic navigation; but the manner is not clearly explained. (See p. 32 of the Provisional Specification, and p. 68 of the printed Specification.)

(Reference is made to Patents in A.D. 1854, N° 224 and N° 1224; and in A.D. 1855, N° 625, but none of these Patents relate to Marine Propulsion.)

[Printed, 6*s*. Drawings.]

A.D. 1856, September 11.—N° 2125.

COWARD, Richard Atkinson.—Paddle-wheels. The floats are deep and flanged at the sides, and few in number.

[Printed, 6*d*. Drawings.]

A.D. 1856, September 11.—N° 2129.

CHAPLIN, Alexander.—Steam-vessels without keels, having flat bottoms and vertical sides, and steered by side vanes instead of rudders.

[Printed, 4*d*. No drawings.]

A.D. 1856, September 13.—N° 2151.

BUCHANAN, John.—A paddle-wheel or one or two screw propellers work in a channel along a vessel's bottom. The channel may be partly or wholly exhausted of air, so as to ensure the water rising in it. The propeller shaft may be inclined, and carry one vane.

[Printed, 10*d*. Drawings.]

A.D. 1856, September 25.—N° 2248.

PARNELL, William.—(The Patent is void from want of notice to proceed.) Paddle-wheels in a tunnel along the hull of a vessel with two keels.

[Printed, 3*d*. No drawings.]

A.D. 1856, September 30.—N° 2286.

ROSS, Robert Craib.—(The Patent is void from want of notice to proceed.) Paddle-wheel. The float is caused to move more rapidly when at its lowest point than during the rest of its revolution. This is done by cams on an outside independent shaft which act on the arms attached to the floats, and as the arms are not rigidly fixed to the bosses, but on joints, they can be moved separately with increased velocity at the point required. The precise means are not further described.

[Printed, 3*d*. No drawings.]

A.D. 1856, October 17.—N° 2419.

TOMBS, Edward.—Screw propeller. The blades have flanges, or the outer ends are bent towards the vessel's bow. Two screws may be used. The second of these is on a short shaft behind, and a little above the shaft of the other, so that each shaft has a bearing in a stern-post in the centre of the aperture in the dead-wood. The adjoining ends of the shafts carry cog-wheels, so that they gear together and are turned in opposite directions. The after screw may revolve faster than the other.

[Printed, 3*d*. No drawings.]

A.D. 1856, October 17.—N° 2421.

FOGGI, Ferdinando.—Marine engines. Boxes partly circular and pistons with curved piston-rods are so attached by clicks and palls to the ratchet work of a wheel that the relative motion of the pistons and cylinders causes the wheel to revolve. The manner of adapting this to marine propulsion is not explained.

[Printed, 7*d*. Drawings.]

A.D. 1856, October 23.—N° 2487.

BREMER, John Christian.—Feathering paddles. The paddle-floats are feathered by the action of cog-wheels on their horizontal axes moved by a stationary central wheel, so that they remain vertical as they revolve. The manner of effecting this is not clearly explained, and the drawings have no letters of reference.

[Printed, 6*d*. Drawings.]

A.D. 1856, October 24.—N° 2501.

STRUTHERS, Robert.—Screw propeller. The propeller shaft is caused to work at a different speed from that of the driving-shaft by intermediate gearing. The shafts are in the same line; the end of one turns in a hollow at the end of other. The driving-shaft has a disc or arm carrying a cog-wheel which gears internally with a stationary cogged rim, and causes it to revolve and to turn another wheel fixed on the propeller shaft.

[Printed, 9*d*. Drawings.]

A.D. 1856, November 4.—N° 2586.

CAMPBELL, Ethan.—Water is forced out through tubes to propel a vessel. The engine used for this consists of a cylinder with two tubes entering it close to each other, one of them is to receive and the other to discharge the water. A shaft through the centre carries two excentrics which support another cylinder a little more than half the diameter of the first, and rolling inside its inner periphery. The excentrics carry a broad rectangular slide which passes through a long slot or aperture between the entrances to the two tubes, and thus constitutes a moving abutment in a manner explained by the aid of the drawings.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1856, November 18.—No. 2724.

DYER, Samuel.—Screw propeller. A train of wheels to be worked by capstans, winches, or other hand power is set in a frame to be moved about a vessel's deck (on rails if needful), and geared when required to an upright shaft which it turns by bevil gearing. Various plans are described for disconnecting the shafts and drawing up the propeller along grooved guides.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1856, November 21.—N° 2755.

NORMAN, John.—(The invention did not proceed to the Great Seal.) Screw propeller. Each blade turns in the boss until a stop secures it in a proper position. The surface of the blade is partly in advance of its radial axis, but the greater part being astern of it, the blade is feathered fore and aft by the action of the water when the propeller is at rest. Directions are given for additional sails to be used.

[Printed, 3*d*. No drawings.]

A.D. 1856, November 28.—N° 2813.

GRIFFITHS, ROBERT.— Screw propeller. This may be driven by a shaft turned by another screw propeller in the bows which revolves by the action of the water as the ship moves through it.

A hollow keel may be used and bows of a particular shape, also engines with a trunk cylinder.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1856, December 8.—N° 2905.

EATON, RICHARD.— India-rubber springs, consisting of alternate laminæ of vulcanized india-rubber and metal plate, are to be used in attaching hawsers to vessels for towing purposes. (See page 7, line 10, of the printed Specification.)

[Printed, 10*d.* Drawings.]

A.D. 1856, December 19.—N° 3006.

BEAVER, LOUIS.—(The Patent is void from want of notice to proceed.) Reciprocating vanes are feathered for the return stroke; no particular description of them is given.

[Printed, 3*d.* No drawings.]

A.D. 1856, December 26.—N° 3064.

DE MARCESCHEAU, ARMAND JEAN BAPTISTE LOUIS. — Transverse cranked shafts carry frames with paddles that dip into the water vertically, and move through the air for the return stroke. The other apparatus described does not relate to marine propulsion.

[Printed, 2*s.* 5*d.* Drawings.]

A.D. 1857, January 1.—N° 4.

BOURNE, JOHN.—(The Patent is void from want of notice to proceed.) Barges with concave and convex ends are coupled together in a train to be towed by a steamer. They may be steered by adjusting the position of the last of the train. Screw propellers at the bows, or paddle-wheels* at the sides, may work on the bottom in shallow water, and thus clear it away and propel the vessel. A centrifugal wheel may also be used. If the foremost barge gets aground while the train is descending a rapid stream a pole is lowered from the last barge so as to stop the train.

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* A paddle-wheel steamer for this purpose lies near Westminster Bridge (June 1858.)

[Printed, 3*d*. No drawings.]

A.D. 1857, January 5.—N° 43.

HYDE, John Moore.—Screw propeller. The afterpart of the vessel is constructed so that, being wider at the "screw post," the propeller may be enclosed between shutters.

A condenser is formed by partitions in the stern dead-wood, and pipes may conduct the water from without into the chamber, which is provided with a manhole.

[Printed, 5*d*. No drawings.]

A.D. 1857, January 10.—N° 96.

BROOMAN, Richard Archibald.—(The Patent is void from want of notice to proceed.) Horizontal submerged wheels revolve in cases by which part of each is covered.

[Printed, 3*d*. No drawings.]

A.D. 1857, January 16.—N° 136.

MOORE, George Storey.—Screw propeller. The boiler is on deck, and the engine is below deck while the propeller shaft is as short as possible.

[Printed, 6*d*. Drawings.]

A.D. 1857, February 12.—N° 420.

WINGATE, Thomas.—Screw propeller. Each blade is attached to the boss by the shank passing through a hole, and at this part the shank is conical, so that when it is pressed towards the centre the blade is firmly fixed.

In the hollow boss is a lever arrangement (worked by a screw and key from the vessel) for pressing the shanks outwards, so as to allow one of them to be turned by a clip applied from above to its outer edge, which is moved until it stands uppermost for the purpose. A cogged sector in the shank turns a cogged wheel loose on the shaft, and embracing the boss. As this wheel gears *into the* sectors of both blades, when one is turned the other is *caused to* set in a corresponding position.

[*Printed*, 10*d*. Drawings.]

A.D. 1857, February 14.—N° 438.

FULTON, Hamilton Henry, and ETTY, Thomas Bodley.—(The invention did not proceed to the Great Seal.) Boilers and locomotive engines. There are no allusions to marine propulsion, though the title contains the word "Propelling."

[Printed, 3*d*. No drawings.]

A.D. 1857, February 21.—N° 519.

QUIDDE, Auguste, and MAYET, Charles.—Screw propeller. This acts in a cylinder under water, or pistons may act directly on the water in the cylinder.

[Printed, 6*d*. Drawings.]

A.D. 1857, February 28.—N° 584.

STUBBIN, Frederick.—(The Patent is void from want of notice to proceed.) Chains of floats turning on drums at a vessel's side.

[Printed, 3*d*. No drawings.]

A.D. 1857, March 5.—N° 655.

COWARD, Richard Atkinson.—Screw propeller. The blades are broadest near the shaft, and the boss is not large.

[Printed, 5*d*. Drawings.]

A.D. 1857, March 7.—N° 671.

Mc GRADE, Patrick.—(The Patent is void from want of notice to proceed.) Feathering paddles. These are on frames worked by two parallel cranks so as to keep the floats vertical, as illustrated in a rough fac-simile drawing attached to the Specification.

[Printed, 6*d*. Drawings.]

A.D. 1857, March 21.—N° 800.

CROOKER, Matthew Augustus.—Paddle-wheels. The wheel is in sections, each of them with their floats descending to various depths, and so placed that the floats of adjoining sections will descend to different depths.

[Printed, 5*d*. Drawings.]

A.D. 1857, April 22.—N° 1130.

WILLIAMS, William.—(The invention did not proceed to the Great Seal.) An oar is worked with a sculling motion, in a manner not described.

[Printed, 3*d*. No drawings.]

A.D. 1857, April 23.—N° 1193.

BARKER, James.—(The Patent is void from want of notice to proceed.) A blade on the end of a shaft works to and fro, and feathers for the return stroke by means not described.

[Printed, 3*d*. No drawings.]

A.D. 1857, April 29.—N° 1201.

REED, Joseph Haythorne.—(The Patent is void from want of notice to proceed.) Paddle-wheels. The floats are inclined at an angle to the shaft.

[Printed, 3*d*. No drawings.]

A.D. 1857, May 2.—N° 1240.

PATERSON, Alexander John.—Screw propeller. The thread is on a hollow conical drum, the larger end of which corresponds with the circular vertical end of the vessel. The drum revolves close to this end, and thus constitutes the bow or stern of the vessel.

[Printed, 9*d*. Drawings.]

A.D. 1857, May 16.—N° 1391.

OGLE, Nathaniel.—(The invention did not proceed to the Great Seal.) The steam-engine works air-engines which are used to ventilate the vessel and to work pistons acting directly on the water.

[Printed, 3*d*. No drawings.]

A.D. 1857, May 25.—N° 1463.

RODD, Walter James Handscombe.—(The Patent is void from want of notice to proceed.) Air-tight hollow drums suppor a vessel, and propel it by floats on their peripheries.

[Printed, 3*d*. No drawings.]

A.D. 1857, May 27.—N° 1506.

GRAHAME, THOMAS.—Boats are hauled up inclines uniting different levels in canals by using the steam-engine on the tug-boat in conjunction with suitable gearing on land, and with rails and wheeled cradles, which secure the boat while in the water.

[Printed, 3*d*. No drawings.]

A.D. 1857, May 30.—N° 1530.

JAMES, JOHN, and GRIMSHAW, WILLIAM DAYKIN.—Screw propeller. This is turned by the reactionary force of water pumped through the hollow propeller shaft and discharged through curved openings at the ends of the blades. The arrangements for reversing the action are described.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1857, June 1.—N° 1538.

LAMBERT-ALEXANDRE, LAZARE PROSPER, and MALLET, LOUIS PIERRE FELIX.—Reciprocating frames work to and fro under water, and carry floats which feather for the return stroke by the operation of cams, rollers, and tappets.

[Printed, 7*d*. Drawings.]

A.D. 1857, June 5.—N° 1581.

CLAIR, JOSEPH ETIENNE MARIE JEAN.—(The Patent is void from want of notice to proceed.) Screw propellers. These are hollow tapered barrels on each side of a vessel.

[Printed, 3*d*. No drawings.]

A.D. 1857, June 10.—N° 1634.

NEWTON, ALFRED VINCENT.—A vessel with vertical sides and flat bottom is shaped like a triangle, with the vertex for the bow and the base at the stern. It is propelled by air discharged under water by pumps, or the dilation produced by heat. The vessel is steered by rudders which direct the current of air.

[Printed, 7*d*. Drawings.]

A.D. 1857, June 12.—N° 1653.

CARLEMAN, CARL GUSTAF.—(The Patent is void from want of notice to proceed.) Screw propeller. The aperture in the deadwood is larger at the parts further from the boss, so as to allow the ends of the blades to carry cylindrical vanes of a form not described.

[Printed, 3*d*. No drawings.]

A.D. 1857, June 22.—N° 1739.

FONTAINEMOREAU, PETER ARMAND LE COMTE DE.—(The Patent is void from want of notice to proceed.) Wheels placed obliquely and connected by rods carry paddles which enter the water in an oblique direction.

[Printed, 3*d*. No drawings.]

A.D. 1857, June 26.—N° 1795.

BOURNE, JOHN.—Boats are attached in trains by articulating the bow of one to the hollow stern of the next. They are propelled by screws or paddle-wheels at the sides or bows which act on the water or bottom, or by jets of water, and the train is steered by altering the position of the boats at the articulated joints.

A pole may be lowered at the stern of the last boat to hold it back when the train descends a rapid stream.

[Printed, 1*s*. 10*d*. Drawings.]

A.D. 1857, June 26.—N° 1802.

GAUDRION, STANISLAS.—Screw propeller. The blades are flat or ribbed in grooves so as to keep the water from being for towards the periphery as the propeller rotates.

[Printed, 5*d*. Drawings.]

APPENDIX.

APPENDIX A.

Papin and Leibnitz.

[The following information is obtained from unpublished MSS. collected by the late Mr. R. Prosser of Birmingham, and consigned by him to Mr. Bennet Woodcroft, at the Great Seal Patent Office.]

M. D. G. C. Bottyer, Ph. D., of New Town, Hanover, in 1851 revised the entire correspondence between Leibnitz and D. Papin, copies of which are in the Royal Library at Hanover. (The pages of reference are those of the revised MS., selections from this correspondence).

1692. Papin describes a submarine vessel moved by oars at the sides—supplied with air from above by tubes—rising and sinking by water pumped out of or into internal vases, with a mercurial gauge, steered by a compass, and lighted by glass windows (p. 1). Leibnitz says that Van Drebbel's boat (*see* Marine Propulsion, p. 10) went some distance under water in the Thames, but he is not sure as to whether it received external air for respiration. He suggests spirits of wine for purifying the air (p. 6).

1695. Papin disclaims the use of spirits of wine (p. 7). (The cylinder of Papin's engine is now at Cassel, in the possession of Messrs. Henschell. The model was destroyed by the French in 1806). Papin speaks of water above his piston to exclude air (p. 10).

1698. Papin says that experiments proved to him that "the force of fire can be applied to more important purposes than raising water" (p. 18). Leibnitz answers that he also had thought of the use of fire for raising water (p. 19). Papin replies (p. 20) that he employed both suction and pressure by steam; had made a model of a carriage propelled by this force, which succeeded, and hoped it would answer for boats.

Leibnitz points out the disadvantages of using gunpowder (as Papin had done), and suggests that other liquids might do better than water (p. 21). Papin replies that he had raised water to the height of 70 feet (p. 22), that he knew gunpowder was less useful, that "the pump by means of quicksilver" will never be practicable, and that water should rise slowly in a wide tube. He describes a furnace (p. 24, drawing) with air entering above or forced in by bellows.

Papin was present at a trial of Savery's paddle-wheel boat in 1698 (Marine Propulsion, p. 19.) See American Polytechnic Journal, Washington, 1853, vol. 2, p. 83.

1699. Papin says he saw a machine which raised water by fire before a Parliamentary Committee in England (MSS. p. 25).

1702. Papin says he had made a new and perfect vacuum machine, with a pump five inches in diameter, worked with a pulley (p. 29). He afterwards used a lever, and the piston descended with great force, so as to project missiles (p. 30); mentions another pump (diameter seven inches) which made 200 strokes in an hour. He sent his new pump to Holland (p. 31).

1704. Papin says light well-made pumps would do for land carriages and for those by water, and that infantry could be sent by land, so as to move faster than cavalry (p. 31).

Leibnitz (no date, p. 33) alludes to Amonton's steam wheel, suggests the use of mercury, and asks about Papin's submarine boat. Papin (p. 34) says "the fire-pump ought to be compared to little mortars."

Papin (p. 35) mentions the fulmination of water when struck with a hammer on hot iron, and says it suggests "that more force may be brought out of water than we think." He urges the importance of using steam rather than gunpowder to produce a vacuum under a piston (p. 36).

1705. Papin (p. 38) says that six or seven years ago he had succeeded well in forcing up water by the pressure of steam, and then drawing it from below to the vessel by condensing the steam, and that this was somewhat different from the English plan (no doubt Savery's).

Papin mentions (p. 39) that he was ordered to construct a corn mill to be moved by this fire-pump, and reasserts the importance of applying it to carriages by water.

In a letter to Leibnitz, dated Cassel, July 23rd (p. 40), Papin says, he finds the steam gets condensed by the surface of water, and that he has tried with success a piston interposed. He alludes to Mr. Thomas Savery's book, and says he, Papin, had used a tube 7 inches in diameter.

Leibnitz replies (p. 41), suggesting that flame should be used to get up steam, that the water should be raised by successive stages, that air might be used to transmit power through tubes by exhaustion or pressure. He speaks of Papin's pistons, and of his own arithmetical machine.

Papin writes (Sept. 17, p. 42) that he now used the pump only to force and not to draw by a vacuum, and thus kept it warm, instead of alternately heating and cooling it. A hot iron was to be kept in it. He speaks of a successful trial of a piston, a tube of 16 inches diameter, and suggests that the water should be sent 500 feet high at once.

He writes (19 October, p. 43) that he has succeeded with a pump having only two valves. He forces the water by means of a piston pump into a receiver containing compressed air, which raises it in a continuous stream. He explains (not clearly) certain difficulties in using compressed air without a piston.

From a subsequent letter of Leibnitz to Papin (dated 4 Feb. 1707), it appears that Papin used his piston to force air so as to act on the water without letting the water touch the piston. He alludes to the intention of using his engine for conveyance by water (p. 44).

1706 (June 26, p. 45). Papin mentions that a piston steam pump of 16 inches diameter and 16 inches stroke, making its downward stroke in a second, forced water to the top of the House of Arts.

1707 (Feb. 4). Letter to Papin (from Leibnitz (?)), describes a valve apparatus for introducing water to the boiler every time it is turned, and means for applying heat of the escape steam to expand the compressed air, suggests that compressed air might be used for portable engines, also that valves might easily be moved by the engine without manual labour.

Papin answers (April 7) that he used a tube with two valves for replenishing the boiler, and that the escape steam was applied to heat the cylinder.

July 7. Papin says his request had been granted for permission to go to England, and one reason he had alleged in making the request was that it was "important that the new construction of vessel should be put to the proof in a "seaport like London, where one could give to it enough depth to apply the "new invention, which, by the means of fire, would make one or two men "capable of producing more effect than some hundreds of rowers. In fact, my "design is to make the voyage in the same vessel of which I spoke to you before, "and one can see that immediately by that model it will be easy to make others "where the fire machine can be conveniently applied."

He asks Leibnitz to obtain permission for his boat to pass from the Fulda to the Weser by Münden, and requests information as to currents in the river.

Leibnitz appears to have asked permission (July 13), and on July 25 officially communicated to Papin that the Electoral Privy Council, without assigning any reason, declined to grant the permission.

Papin writes (August 11) that he finds the permission can be easily had at Münden.

Writing from Cassel (Sept. 15), Papin asks Leibnitz when he will come to Cassel to begin their voyage. He says the experiment with the boat had succeeded. The current seemed to make little difference when his oars (*rames*) were used, "and I am persuaded that if God allows me to arrive in London and "to make some vessels of this new construction which may be of depth enough "to apply the fire machine to give motion to the oars,—I am persuaded, "I say, that we can produce results which will appear incredible to those "who have not seen them." He says he has been informed that he must have the permission of the Elector before passing Münden. In a postscript he writes that he finds this is not required.

September 27. Zeunder (a magistrate) writes to Leibnitz (?) from Münden, that the boatmen there had on the day previous taken from Papin "Sa petite "machine d'un vaisseau a roues que vous aurez veu," which he meant to take to the Queen of England. An extract from a letter (Oct. 20) to Leibnitz says that "Poor Papin was obliged to leave his vessel at Münden."

From this correspondence there is no evidence that Papin had made a steam-vessel; on the contrary, it appears that the boat which he thus lost was repeatedly declared (at the time) to be only a model, "machine," "not a ship," but a curiosity to be shown to the Queen of England, and a pattern from which other vessels might be made.

Professor Rühlmann, of Hanover, in his Supplemental Paper on the history of the invention of the steam-boat, published at Hanover, asserts that the above correspondence proves that Papin's boat was moved by steam. He mentions, also, that Papin left aside his own idea of a steam-boat (see Abridgments, p. 18.) and turned his attention to Savery's (by pumping water on a wheel). In a published copy of the Acts of the Court of Council at Münden, and the representations made by the boatmen who destroyed the model, nothing whatever can be gathered as to steam being used in it. It is mentioned that there are drawings still in the King's Library at Hanover left by Papin and Leibnitz, but not examined.

APPENDIX B.

STEAM-BOATS IN AMERICA.

The following notes are collected from the Life of John Fitch, Philadelphia 1857; the American Polytechnic Journal, Washington, 1853; the Inventor's Guide, by J. G. Moore, Philadelphia, 1855; and other American authorities referred to. The evidence relating to early American claims is very conflicting in several of the most important dates and particulars.

1772. Christopher Colles lectured on the steam-engine. He was the first person who made a steam-engine in America (p. 153, note).

1776. William Henry had thought of steam. (Life of Fitch, p. 138.) and before him Thomas Paine suggested the plan of applying steam to the verge of a wheel (p. 170). At p. 138 it is said that Paine suggested it in 1778.

The Inventor's Guide (p. 318) says that Paine recommended to Congress that steam-boats should be built after the plan of Jonathan Hulls (*see* Marine Propulsion, p. 22), and that Jouffroy's pamphlet was published in America in 1785; also that Henry had conversed with Ellicott in 1776 on the matter. The plans of Bernouilli, and no doubt of Euler (Marine Propulsion, pp. 25, 26), "were not "unknown to Dr. Thornton, one of the associates of Fitch."—Polytechnic Journal, p. 241.

1783. "Rumsey may have *thought* of steam."—Life of Fitch, pp. 243, 247.

September 1784. General Washington certified that Rumsey had "discovered "the art of working boats by mechanism and small manual assistance against "rapid currents."—Life of Fitch, p. 140 (n.)

This boat was moved by a paddle-wheel between two hulls. It was turned by the stream, and worked poles against the bottom of the river (*ibid.*, p. 220).

In 1838, Orrick certified that Rumsey's boat was moved by steam in 1784 (p. 245).

November 1784. Rumsey petitioned the Pennsylvania Assembly concerning this boat (p. 220); and *see* post, under date 1787.

March 1785. General Washington alludes to Rumsey's boat on the plan already described.—Life of Fitch, p. 140 (n.)

April 15, 1785. Fitch conceived the idea of a steam-boat.—p. 119.

June, 1785. Fitch showed Scout a plan of the boat. He then made a model with paddle-wheels.—p. 123.

August 20, 1785. Dr. Ewing speaks of Fitch's boat with wheels moved by the alternate action of steam and the atmosphere (p. 126). On Aug. 25, the plan was laid before Cadwallader, Member of Congress, and a petition presented to Congress, Aug. 29 (p. 215).

August 1785. Franklin proposed to propel by (hand) pumping water or air through a tube (*ibid.*, 135, drawing). The "General Advertiser," Nov. 1791, says that Franklin proposed to use steam for pumping the water in 1785 (*ibid.*, 135), and he laid it before the Philosophical Society, Dec. 2, 1785 (p. 215).

Sept. 1785. Fitch presented models of his boat, in which an endless chain of floats was substituted for paddle-wheels (p. 131, drawing).

Sept. 27, 1785. Ewing certifies that Fitch explained to him his intention to use a tube bent and turned across, to heat the water (as a tubular boiler) (p. 228, drawing).

Dec. 1785. Schley certified that he saw Fitch's model (p. 239).

1785. Evans published an account of his paddle-wheel boat.—Pol. Journal, p. 242.

March 11, 1786. Donaldson and Fitch presented separate memorials to the Legislature of Pennsylvania, each claiming a right exclusively to use steam in propelling boats (Life of Fitch, pp. 149, 150). Fitch renewed his petition in November (p. 170), and it was passed into a law in March 1787 (p. 173).

March 18, 1786. A law was passed in New Jersey, giving the exclusive right to propel boats "by the force of fire or steam" to Fitch for 14 years (p. 151).

There were then only three steam-engines in operation in America, all made in England, p. 153 (note).

April 1786. Fitch's Steamboat Company formed (p. 216).

July 13, 1786. Fitch mentions a steam-engine with a three-inch cylinder, which he was preparing for a small skiff in the first instance, to be moved by machinery turned by hand (p. 158).

July 1786. Fitch moved his skiff with "a screw of paddles," the endless chain, and crank oars, by steam (*ibid.*, p. 216). But the use of the engine seems only to have been suggested for this while it was moved by hand, July 28, 1786 (*ibid.*, p. 160).

Sept. 4, 1786. Fitch says he is "morally sure, from experience, that a vessel may "be propelled to great advantage through the water by means of a steam-"engine" (p. 162).

Dec. 1786. In the "Columbian Magazine," Fitch published a drawing and account of his steamboat, which had a central transverse shaft, moving cranks with horizontal rods, working six oars nearly vertical on each side of the boat; three of the six at each side entered the water at once (p. 178, drawing). The account was corrected in a succeeding number (date not given). A horizontal cylinder was worked by steam at each end. "The piston is to move about three feet, and "each vibration of the piston turns the axletree about two-thirds round." The caps of the cylinder were of wood (p. 185).

In this year Evans suggested to Fitch the use of the side wheels, but was informed that Fitch had already thought of this, and rejected it.—Inventor's Guide, p. 322; Polytechnic Journal, p. 243.

1787. Delaware (in February, Life of Fitch, p. 176), Pennsylvania (in March, p. 173), New York (in March, p. 176), and Virginia (in November, p. 197), passed laws in favour of Fitch similar to that in New Jersey, 1786.

"Rumsey ultimately triumphed in Virginia, Maryland, and New York, while "Mr. Fitch made good his claim in New Jersey, Pennsylvania, and Delaware." Inventor's Guide, p. 326.

February 9, 1787. An agreement was signed concerning the steamboat of Fitch.

August 22, 1787. Fitch's boat (45 feet long and 12 feet beam) was moved by steam with a 12-inch cylinder, and several public functionaries gave testimony (Life, pp. 186, 192.)

1787. Committee of Congress reported (February 1839) that Rumsey was the first who thought of a steamboat, and demonstrated the feasibility of it by actual experiment (probably referring to a trial in 1787).—*Ibid.*, 246.

1787. Cartwright about 1787 made a model of a steam-engine to be attached to a barge for propulsion, and gave it to Fulton in 1799. (*Ibid.*, 388, quoting "Gentleman's Magazine" (London), February 1832, p. 108).

December 11, 1787. Eleven persons testified that they saw Rumsey's boat moved by steam on this day by pumping water (p. 211, drawing; *see also* p. 267, note).

January 1, 1788. Rumsey published a pamphlet asserting that he was the inventor of the steamboat, and that Fitch was a plagiarist (Life, pp. 204, 207).

1788. Rumsey and Fitch presented plans of boilers. (That of Fitch is described *ante*, under date 1785). Rumsey's was an upright boiler with two cylinders joined at top and bottom containing water between (p. 232, drawing). Rumsey went to London to secure patents (p. 262). The Specification of one of these will be found abridged, *ante*, p. 38.

July 1788. Fitch's larger steamboat was used. It was 60 feet long and 8 feet *beam, and had* three vertical oars at the stern, and a "pipe boiler" (Life, p. 249, *drawing at p. 284*).

1790. Fitch's steamboat was improved by an 18-inch cylinder (p. 270). The "pipe boiler" was discarded (p. 274). A new condenser [illegible] (p. 280, drawing), and on April 16 the first of a series of successful [illegible].

The steamboat plied regularly for hire from June to August, [illegible] advertised more than twenty times (p. 280).

The new steamboat "Perseverance" was [illegible] struggles the affair was abandoned and the machinery [illegible].

1791. In August a patent was issued to Fitch for [illegible] by discharge of air or water, or working "cranks and paddles." [illegible] given to others at the same time (p. 328).

1791. Bache proposed to apply steam to a screw-propeller [illegible] or sides of a vessel ("General Advertiser," Nov. 21, 1791, p. [illegible]). H[illegible] also a boat propelled across the Seine by a screw-propeller [illegible] the air (p. 138).

1793. S. Morey used a steamboat with a wheel at the stern at New York, (p. 378).

1796. Fitch is said to have used a screw steamboat at New York (p. 361, drawing).

1797. Fitch made a model steamboat with paddle-wheels. [illegible] a railway car, with flanged wheels and rails at the bottom of the [illegible] to keep it in a straight course (p. 368, drawing). S. Morey and [illegible] cess a paddle-wheel steamboat at Philadelphia, but it was not [illegible] into public use (p. 379).

1798. Fitch having visited Europe and returned to Kentucky in misery, neglect, and drunkenness, committed suicide (p. 369).

In the five years succeeding 1807, more than fifty steamers of large size had been built and started in the American rivers.—See Letter from J. C. Dyer, Jan. 4, 1849, Woodcroft's collection of MSS. In October 1811, the "New Orleans" steamer started from Pittsburg, and reached Natchez on the Mississippi in January 1812.—Life of Fitch, p. 407.

The following facts are mentioned in "Rough Notes about Ocean Steamers," by Thomas Prosser, C.E., of New York, Jan. 5, 1855. (MS. copy is in Woodcroft's collection.) Referring to the "Savannah" (See Abridgments, p. 70), when she visited Liverpool, she is stated to have caused surprise, as if the appearance of a steam-boat was unknown. Yet at this time the "Talbot" plied daily between Holyhead and Dublin: the "Etna" ran as a ferry-boat on the Mersey (Parliamentary Report): the "Rob Roy" plied between Glasgow and Belfast: and the "Mersey" and "Robert Bruce" were at Liverpool. Several steamers had been built and sent across the Atlantic. In all, more than sixty steamers had been built in Britain. The "Congo" was built in 1816, for the Congo expedition, and the "Rising Star," for South America, in 1818. Sir J. Ross refers to the first steamer that crossed the Atlantic as having used steam only for 19 hours. Various discrepancies as to the "Savannah" are recounted, as to her tonnage and build, length of voyage, ports of departure and arrival, the year of her voyage (1817, 18, and 19), the time under steam. The "Savannah" is not mentioned by Jacob Perkins in his evidence (by letter) concerning America before the House of Commons Committee in 1822. Her pretensions are stated to have been set up only in 1838, and they appear to be reduced to this—that she carried paddle-wheels for 26 days, and used them for 8 during her voyage. In the "Times," June 21, 1819, the "Savannah" is said to have steamed 18 days, starting from Savannah. Cunningham, 1851, says the log-book of the "Savannah" is in the National Institution at Washington (in a letter in the "Times," May 28, 1851). The log is not in the United States Patent Office (Letter from C. Mason, Commissioner, Jan. 22, 1855, to Mr. Woodcroft.)

The British and North American line of steamers between Liverpool and New York ran eight vessels for 15 years without one serious accident. The Collins' United States line, (now discontinued, 1858,) ran four steamers for 6 years, and lost two of them, one with all on board.—*See* the "Times," May 28, 1858, noticing "Ocean Steam Navigation and the Ocean Post," by T. Rainey, New York, 1858.

The "Indian Empire" was tried at Southampton (on May 29, 1858), the first of a line of steamers between Galway and Halifax.—"Times," June 1, 1858, p. 11.

Some other notices of American steamboats are in Appendix C.

APPENDIX C.

STEAMBOAT STATISTICS. PATENT STATISTICS.

The following information is extracted from the Board of Trade papers:—Total number of steam-vessels registered up to Jan. 1, 1857, 1,668, of which there were wooden, with paddle-wheels, 820; with screw-propellers, 19; total of wood, 839. Iron, with paddle-wheels, 356; with screw-propellers, 473; total of iron, 829. From the Navy List, we learn that there are at present in the Royal Navy wooden steamers with paddle-wheels, 67; with screw-propeller, 160; and 185 gunboats. Iron steamers with paddle, 15; with screw, 10; with both paddle and screw, 1. Total number of war-steamers, 427, carrying about 16,000 guns, and of 86,000 horse-power. In 1814 there were only 2 steam-vessels belonging to the British empire. These had increased, in 1855, to 2,010, of 408,290 tons. The number of steam-vessels has doubled since 1845, and their tonnage increased threefold. The first iron steam-vessel was made in 1822. In 1856, 54 wooden and 175 iron steam-vessels were built (tonnage 57,573), and 35 of both kinds were wrecked. Within the last 12 years about 20 large mail packets have been lost. Since 1853, 2,000 persons have perished, and 10 millions of dollars worth of property have been destroyed in the wrecks of the United States coasting mail packets.—See "The Paddle and the Screw," by J. MacGregor, Society of Arts Journal, April 16, 1858, p. 338.

In 1857 there were employed in the home and foreign trade 18,429 sailing vessels (average hands 8·21), and 899 steamers (average hands 27·75); 228 steamers were built in 1857, and the proportion of steamers built to sailing vessels was 21·71 per cent.; in 1843 it was 7·05 per cent.—("Times," June 14, 1858) In 1857 1,085 timber and 193 iron vessels were built and registered; 1,727 vessels sold and transferred; 662 wrecked; and 79 were broken up.—("Times," May 1858).

In 1820 the "Falcon" used steam during part of her voyage to India. The "Enterprize" steamed to Calcutta in 1826. The "Hugh Lindsay" left Bombay March 20, 1830, and arrived at Suez, April 22. She was the first vessel that made a long voyage (1,710 miles) entirely by steam. The "Great Western," in 1838, was the first that steamed the whole way across the Atlantic, without stopping at any intermediate place.—*See* "Rough Notes on Ocean Steamers," by T. Prosser, of New York, 1855, in Woodcroft's MS. collection.

Great Britain has 1,670 ocean steamers. The United States of America, 57. Of these, 121 British and 22 American are engaged in foreign and domestic mail service. There are 1,548 British steamers in the coasting trade and merchant service. America has 37.—*See* "Times," May 28th, 1858, noticing "Ocean Steam Navigation and the Ocean Post," by T. Rainey, New York, 1855. For notices of American steamboats, *see* Appendix B.

The whole number of English Patents relating to Marine Propulsion is 805, from the earliest in 1618 granted to Rumsey to those of June 1857. The following statistics relate to these Patents. Patentees resident in the city of London, 84; in the county of Middlesex and city of Westminster, 254; Surrey, 59; Lancashire, 46; Kent, 29; Hants, 19; Yorkshire, 18; Gloucester, 18; Essex, 11; Sussex, 10; Northumberland, 9; Chester, 9; Worcester, 6; Stafford, 6; Derby, 5; Nottingham, 5; Durham, 5. All the other counties have a less number, and ten of them have only one each. Patentees resident in Scotland, 45; Ireland, 20; America, 18; other foreign states, 46. Patents "communicated from abroad," 65; with two or more patentees, 66. The patentees are described by the following avocations:—Engineers, 273; gentlemen, 252; tradesmen, 74; naval commanders, 14; medical, 11; shipbuilders, 11; peers, 8; shipowners, 8; mariners, 5; machinists, 5; farmers, 4; architects, 4. A less number to each of 21 other professions. There are two female patentees, and the callings of 161 are not mentioned. Eighty-one of the patents are dated in January, 47 in August, and the other months have intermediate numbers. Three hundred and six of these patents are under the new law since 1852, and of these 110 were allowed to become void after six months.—From a Paper on "The Paddle-wheel and Screw-propeller," from the earliest times (referred to above).

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ADDENDA ET CORRIGENDA.

PART I.

Page 1 (note), last line, *for* "Vol. 2." *read* "Vol. 1."

Page 3 (note), line 26 from bottom, *for* "Stenitz" *read* "Steinitz"

Page 3 (note), line 16 from bottom, *for* "Upsalæ" *read* "Upsaliæ"

Page 4 (note), line 9 from bottom, *for* "Compass, mentioned" *read* "Compass. It is mentioned"

Page 6 (note), line 28 from bottom, *for* "Americam" *read* "American"

Page 10, at the end of note (*c*), *add* "See Statistics of Patents, Appendix C."

Page 14, line 6 from bottom, *insert* "It was directed that a model of the Marquis of Worcester's engine should be placed in the Exchequer, and kept there, but on inquiry at the various Record Offices (May 1858), no trace of this model or of any other could be found."

Page 17, line 9 from bottom, at the end of note (*a*), *insert* "Additional information respecting Papin will be found in Appendix (A.)"

Page 18, at end of note (*c*), *add* "This boat is now in the Thames, June 1858."

Page 19, line 13 from top, *for* "Lexion" *read* "Lexicon"

Page 25, *after* line 16 from top, *insert* "About 1750, a Reading farmer tried an experiment on the river Schuylkill (as proposed by Lavier, *see ante*, p. 20, in 1707), with a boat moved by a paddle-wheel turned by the current, and working poles against the bottom for propulsion. *See* Inventor's Guide, by Moore, Philadelphia, 1855, p. 327."

Page 26, line 9 from top, *for* "throuh" *read* "through"

Page 26, line 14 from top, *add* "Drawings will be found in the Society of Arts Journal, April 16, 1858, p. 338."

Page 28, line 3 from bottom, *for* "Muireads" *read* "Muirheads"

Page 29, *after* line 7 from bottom, *insert* "Sir Samuel Bentham, not later than 1775, suggested that a boat should be moved by a steam-engine, with two cylinders. A crank is proposed as the simplest method of connection. The boat was to be steered by stopping one of the engines. The condensed steam to be used for fresh water. Woodcroft's MS. collection."

Page 31, *after* line 7 from top, *insert* "Jeremy Bentham wrote, May 22, 1778, that 'the French ambassador at Vienna, invented last summer a boat with wheels which is put in motion by fire.' Woodcroft's MS. collection."

Page 33, line 6 from bottom, *for* "(pp. 17)" *read* "p. 17"

Page 34, line 6 from bottom, *for* "p. 105 where" *read* "p. 105 (where"

Page 34, line 5 from bottom, *for* "described" *read* "described)"

Page 34, last line, *for* "Se p. 36." *read* "See p. 36." and *add* "The date of Fitch's first attempt should be 1786. See Appendix (B.)"

Page 36, at end of note (*b*), *add* "See also end of note (*c*), p. 34, ante, and see Appendix (C.)"

Page 37, at the end of note (*a*), *add* "An original sketch of 'Dalswinton lake, and the steamboat upon it,' by Mr. A. Nasmyth (in 1788) is in the possession of his son, Mr. J. Nasmyth, and will be found in the Patent Museum. Among the persons present on the trial trip were 'Robert Burns,' 'A. Nasmyth,' and 'Henry Brougham.' *See* MS. letters from Mr. J. Nasmyth and Lord Brougham, Woodcroft's collection."

Page 44, line 8 from bottom, *after* "(*a*)" *insert* "by working swinging oars" (and omit these words in the corresponding note); also *add* "In 1791, Dallery, in France, proposed a screw-propeller. L'Invention, Paris, 1853, p. 123. See the Patent under date 1802, post, p. 52 (addenda)."

Page 48, line 3 from bottom, *add* "worked by hand."

Page 49, line 5 from bottom, *after* "year" *insert* "also Bourne, p. 34."

Page 52, *after* line 7 from bottom, *insert* "In March 1803, Charles Dallery patented in France a screw steamer with a tubular boiler. The screw was at the bow, and another moveable at the stern was used for steering. L'Invention, Paris, 1856, p. 60 (drawing)."

Page 52, line 4 from bottom, *after* "p. 4." *insert* "It was worked by men."

Page 52, in note (*c*), *before* the words "A MS. copy" &c., *insert* "The original of this letter is in the Conservatoire des Arts et Metiers, Paris. *See* end of note (*a*), pp. 105, 6, 7. post." And at end of note (*e*), *add* "Mr. Watt stated to a Parliamentary Committee, that the first steamboat engines made by his firm were for Mr. Fulton in 1804, and were used in his steamer in 1806–7. 'Rough Notes about Ocean Steamers,' by T. Prosser of New York, 1855. (A MS. copy is in Woodcroft's collection.)"

Page 53, line 12 from bottom, *for* "engin" *read* "engines"

Page 57, line 12 from bottom, *after* "Glasgow (*a*)" *insert* "and launched in 1812." And in line 3 from bottom, *after* "engines," *add* "Mr. Dreghorn, of the Clyde Trust, says ('Glasgow Courier,' May 8, 1856), that the engine of the 'Comet,' made by Robertson (and not paid for), is still in Glasgow."

Page 58, line 3 from bottom, *after* "world," *insert* "Mr. Watt stated to a Parliamentary Committee that the first two engines made by his firm, having the cranks working at right angles to each other, were for a boat on the Clyde in 1813. *See* 'Rough Notes on Ocean Steamers,' by T. Prosser, of New York (Woodcroft collection.)"

Page 59, line 10 from bottom, *after* "waters," *insert* "This patent is referred to in the Specification of a Patent in 1831, No. 6,147, *see* post, p. 109."

Page 68, line 8 from the top. The abridgment of Cochrane's Patent, 1818, No. 4,253, (given p. 107,) ought to have been inserted here.

Page 70, last line, *after* "87," *insert* "There are good grounds for doubting this assertion, *see* Appendix B."

Page 73, *after* line 9 from top, *insert* "For steamers to India, *see* Appendix C."

Page 75, *after* line 8 from bottom, *add* "In 1822 the 'Aaron Manby,' the first iron vessel that went to sea, steamed from London to Paris. Mechanics' Magazine, vol. 68 (Jan. 23, 1858), p. 76."

Page 81, line 11 from top, *add* "*See* Appendix C."

Page 84, *dele* the inverted commas " " in lines 1—6.

Page 86. The abridgment of Maudslay's Patent, 1827, No. 5,531, (given p. 107, *post*) ought to have been inserted here.

Page 91, line 13 from top. The abridgment of D'Arcy's Patent, 1828, No. 5719, (given p. 108 *post*), ought to have been inserted here.

Page 92, line 5 from bottom, *dele* inverted commas *before* "Robertson" *insert* them *before* "Paddlefloats"

Page 97, line 9 from bottom, *add* "This feathering paddlewheel is usually called "Morgan's wheel," the patent having been assigned to Morgan."

Page 101, line 20 from top, *for* "paddle whee" *read* "paddlewheel"

PART II.

Page 107, *after* line 20 from top, *add* "'The Rising Star,' a steamer with two internal wheels in an air-tight case, was built in 1818, on the plan of this patent, but the engines were removed afterwards. *See* Woodcroft's MS. collection, 436, and Appendix B."

Page 107, line 9 from bottom, *for* "Infusioritherchen" *read* "Infusionsthierchen," and at the end of the note *add* "Drawings of these animals are given in the Journal of the Society of Arts, April 16, 1858, p. 340."

Page 112, line 7 from top, to the word "prolonged," *append as a note,* "For an account of the argument in this case (when Smith opposed) before the Privy Council, *see* 'Times,' March 12, 1846."

Page 147, line 3 from top, *after* "each" *insert* "rim"

Page 151, line 1 at the top, *for* "frustrum" *read* "frustum"

Page 152, *before* line 15 from bottom, the abridgment of Poole's patent, 1840, No. 8,337 (given at page 209), ought to have been inserted here.

Page 155, *add* to line 5 from top, "Prolonged for six years on March 31, 1854."

Page 161, *after* line 11 from top, *add* "The Leviathan has cogged rims on the paddle-wheels."

Page 171, *after* line 19 from top *insert* "In 1842, the steamer 'Bee' at Portsmouth, was fitted with the screw propeller and paddlewheels for use separately. Tredgold on the Steam engine, App. D., p. 63."

Page 194, line 7 from bottom, *for* "1845" *read* "1846"

Page 194, line 2 from bottom, *for* "stem" *read* "stern"

Page 205, line 9 from bottom, *for* "withdwarn" *read* "withdrawn."

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